

PULP & PAPER



November 1991

*****3-DIGIT 208
0700239798 090192 420
SERVICE INC./SRI
CONGRESSIONAL INFORMATION
4520 EAST WEST HWY
BETHESDA MD 20814

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THE COVER

Chemical pulping technology is rapidly changing, reacting to various market factors, such as the new environmentalism and demands for higher quality pulp. The newest greenfield mills are installing the most efficient and environmentally safe equipment to ensure their competitiveness into the next decade. The cover photo, a 3-D CAD diagram of Alabama Pine Pulp Co.'s fiber line in Perdue, Hill, Ala., represents the pulp mill of the future. This issue's focus on chemical pulping includes a report on the cost of a kraft pulp mill in the year 2000 and also explores alternatives to conventional chlorine-based pulping. (Photo from PASCE—Plant Applications and Software from Combustion Engineering—system courtesy of H.A. Simons Ltd.)

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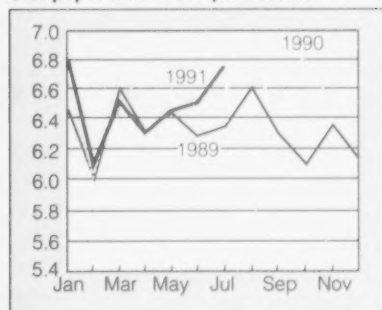
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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send addresses changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1991 by Miller Freeman Inc. All rights reserved. **Subscriptions & Address Change:** Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$85.00 a year in the U.S. All subscriptions to other countries: US\$105.00 a year, except Europe and Mediterranean, US\$120.00 (air service included). Single copy, US\$8.50, except Buyers Guide, US\$47.50. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. **Send subscription correspondence to:** Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-267-7645. For address change, include label from recent issue.



MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.7 million tons in July, up 2.9% from the same month last year, according to the American Paper Institute. The rising trend evident in June continued through July and into August, according to preliminary data. The seasonally adjusted July-August rate may have moved to a record 81 million tpy. Paper production receded slightly during the July-August period, but paperboard continued to show gains.

Among major grades, newsprint and uncoated free-sheet led a rebound in communication papers. Strong demand for bond papers helped fuel a 13% increase in uncoated free-sheet shipments between June and July. The slowdown in magazine advertising continued to hurt coated groundwood, but coated free-sheet shipments climbed in response to strong demand from catalog publishers. Containerboard output was up 13% on the strength of continued double-digit gains in production for export.

Canadian newsprint shipments totaled 697,000 metric tons in July, down 7.2% from July 1990. Newsprint mills operated at 85% capacity, down from 94% last year. Woodpulp shipments climbed 11.4% to 663,000 tons, despite a drop in operating rates from 89% last year to 85% in July 1991.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	July	586	4.6	6,799	4.6
Uncoated groundwood (s)	July	159	4.6	1,751	-1.9
Coated paper (s)	July	640	0.9	7,120	-3.8
Uncoated free-sheet (s)	July	1,044	10.2	11,281	-1.5
Other printing/writing	July	116	-7.2	1,466	-5.2
Total packaging and other paper (s)	July	356	-6.6	4,474	-1.9
Tissue	July	440	-8.7	5,679	-1.0
Total paper	July	3,342	1.9	38,569	-1.0
Unbleached kraft paperboard	July	1,798	3.6	20,381	1.7
Semichemical medium	July	481	-1.6	5,662	-0.7
Bleached paperboard	July	394	11.0	4,610	2.8
Recycled paperboard	July	729	4.6	8,891	-0.9
Total paperboard	July	3,403	3.8	39,544	0.9

Total U.S. paper and paperboard output	July	6,745	2.9	78,113	-0.1
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	June	5,197	0.4	63,202	1.6
Market pulp production	June	745	-5.0	9,003	3.8
Wastepaper consumption at paper/board mills	June	1,795	-0.2	21,225	2.4
Pulpwood consumption (cords)	June	7,992	-0.6	98,896	0.1

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	July	27,968	4.8	184,805 ⁶	-1.0
Containerboard inventories at U.S. box plants and mills	June 1	2,637	5.4		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	June	967	-12.6	12,148	-8.5
Imports of Canadian newsprint	June	603	-13.4	7,657 ⁶	-9.7
U.S. paper exports (including products)	June	733	27.7	8,252	20.9
Exports of unbleached kraft linerboard	June	270	10.2	3,096	15.4
Exports of woodpulp	June	573	2.3	6,475	9.8
Norscan pulp inventories ⁴	July 31	1,653	18.3		
Norscan pulp operating rates ⁴	July	84%	87%	85%	87%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	July	697	-7.2	5,068 ⁶	-7.7
Operating rates	July	85%	94%	89%	95%
Inventories held by U.S. consumers	July 31	1,433	3.8		
Other paper/board shipments	July	631	2.6	4,199	-2.6
Woodpulp shipments (export only)	July	663	11.4	4,842	10.0
Operating rates	July	85%	89%	89%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft paper: New competition from recycled grades and imports dims growth prospects

Grade Structure: Commodity bag and sack paper is the largest category of kraft packaging papers, accounting for about 60% of total shipments in 1990, followed by multiwall at 32%, converting at 5%, and wrapping at 3%.

Production/capacity: Domestic shipments of unbleached kraft paper (UKP) declined by 11.4% to 2,377 million tons in 1990, after declining 4.2% in 1989. Grocery bag and sack paper shipments declined 18.5%, and multiwall paper shipments dropped only 0.2%. Operating rates plummeted to around 85% because of sharply lower shipments.

Total bleached kraft paper (BKP) shipments increased 3.4% to 484,000 tons in 1990. This number may represent the peak level of shipments for some time because McDonalds and other major fast-food restaurants are now using more recycled bag paper. The decline in demand for BKP has resulted in some mills converting production to nonpackaging bleached paper grades. As a result, BKP is more available now than at any time in the past few years. Fast-food makes up about 140,000 tpy of bleached bag paper use.

For the first seven months of 1991, total UKP shipments were down about 3% from the year before, with mixed results among the major grades. Multiwall paper shipments were down 4.7%, due to the continuing recession in construction and industrial activity. Domestic shipments of grocery bag and sack paper during the first seven months were up about 2%, marking a turnaround from the long-term decline in this segment.

Shipments of BKP fell sharply in the first half of 1991 as the transition to recycled grades at fast-food restaurants gained momentum. Domestic BKP shipments fell 15% in the first seven months of the year. Specialty packaging papers increased a strong 11%, paced by the startup of two new paper machines by Consolidated Paper Co. and Longview Fibre Co. at the end of 1990. Longview's new machine produces both bleached and unbleached lightweight packaging grades, and Consolidated Paper's new machine produces lightweight coated specialty grades for packaging and labels.

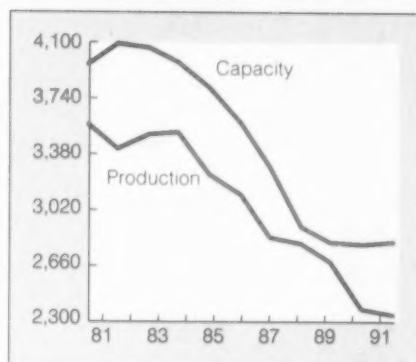
Outlook: Following a decade-long decline, grocery bag and sack paper shipments may have finally bottomed out. Demand for kraft paper grocery bags is expected to benefit from increased environmental concerns over plastic bags. Some of the gains in the grocery bag war will be shared with recycled bag paper, which currently accounts for approximately 7% of total UKP shipments.

Bleached kraft has lost minimal market share to plastic bags in traditional food and restaurant markets, but recycled grades are expected to gain market share. As a result, BKP shipments will likely fall by 10% or more this year. Shipments of multiwall paper and shipping sacks will continue to be weakened by poor market demand in specialty and commodity chemicals, manufacturing, and agricultural products. However, demand will remain good for specialty multiwall packaging for pet foods, bakery goods, and other consumer products.

Pricing: Producers increased BKP and UKP prices approximately \$40/ton in the first quarter of 1989 but have been unsuccessful in several subsequent efforts to raise prices further. In fact, heavyweight 70-lb grocery sack paper prices have been sharply discounted over the past year. Beginning in late 1990, prices fell from about \$495/ton to approximately \$425 to \$435/ton this year. Multiwall paper prices have remained firm at about \$550 to \$560/ton for standard 50-lb grades, and lightweight unbleached grades have also remained firm at about \$630 to \$660/ton for 30-lb grades. Prices of lightweight bleached grades have also remained unchanged at about \$800 to \$810/ton despite the sharp drop in shipments.

Year-end price history for 70-lb grocery sack paper is as follows: 1980, \$280; 1981, \$300; 1982, \$240; 1983, \$280; 1984, \$330; 1985, \$300; 1986, \$365; 1987, \$400; 1988, \$455/\$465; 1989, \$495/\$500; 1990, \$475. Prices for 50-lb multiwall sack paper were as follows: 1980, \$375; 1981, \$405; 1982, \$360; 1983, \$390; 1984, \$410; 1985, \$360; 1986, \$400; 1987, \$460; 1988, \$510/\$520; 1989, \$550/\$560, 1990, \$550/\$560.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1989	1990	1991e
Shipments	2,681	2,377	2,340
Capacity	2,809	2,795	2,811
Utilization rate	95.4%	85.0%	83.2%
Imports	240	235	250
Exports	95	90	80
Apparent U.S. consumption	2,826	2,522	2,510
lb/capita	22.4	20.2	20.1
GNP ratio ¹	0.70	0.63	0.62

e = estimate.

¹ 1,000 tons/\$ billion real GNP.

Source: American Paper Institute, Pulp & Paper estimates.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity ¹	Market share (%)
1. Stone Container	576	20.5
2. Longview Fibre	441	15.7
3. Union Camp	300	10.7
4. Georgia-Pacific	295	10.5
5. Gaylor Container	270	9.6
6. International Paper	260	9.2
7. Champion International	195	6.9
8. Chesapeake	115	4.1
9. Port Townsend	100	3.6
10. Willamette	70	2.5

Market share of top five companies:

67.0%

Market share of top ten companies:

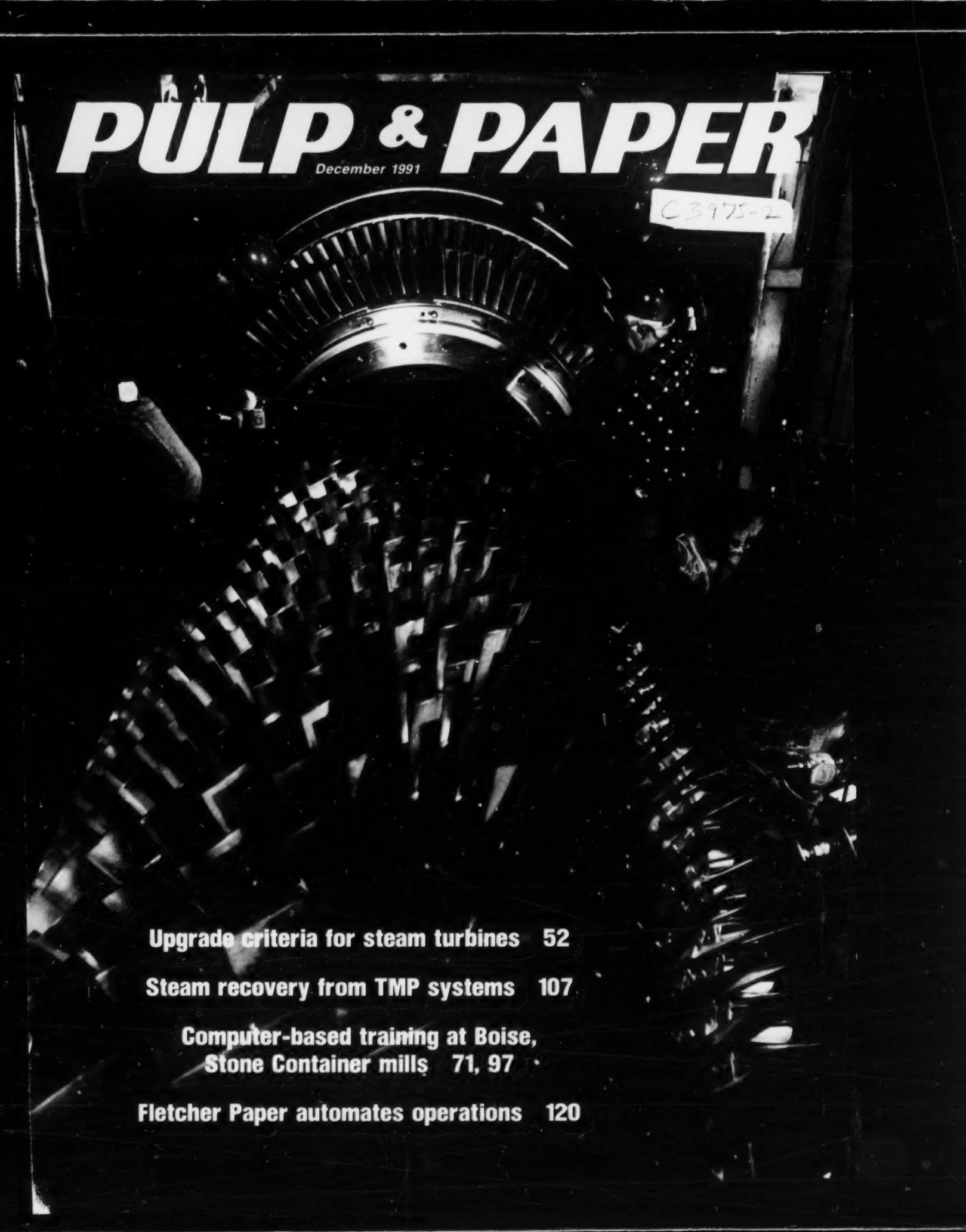
93.3%

Total U.S. capacity (1991):

2.811 million short tons

¹ Unbleached kraft paper capacity does not include bleached kraft paper or specialty grades.

PULP & PAPER



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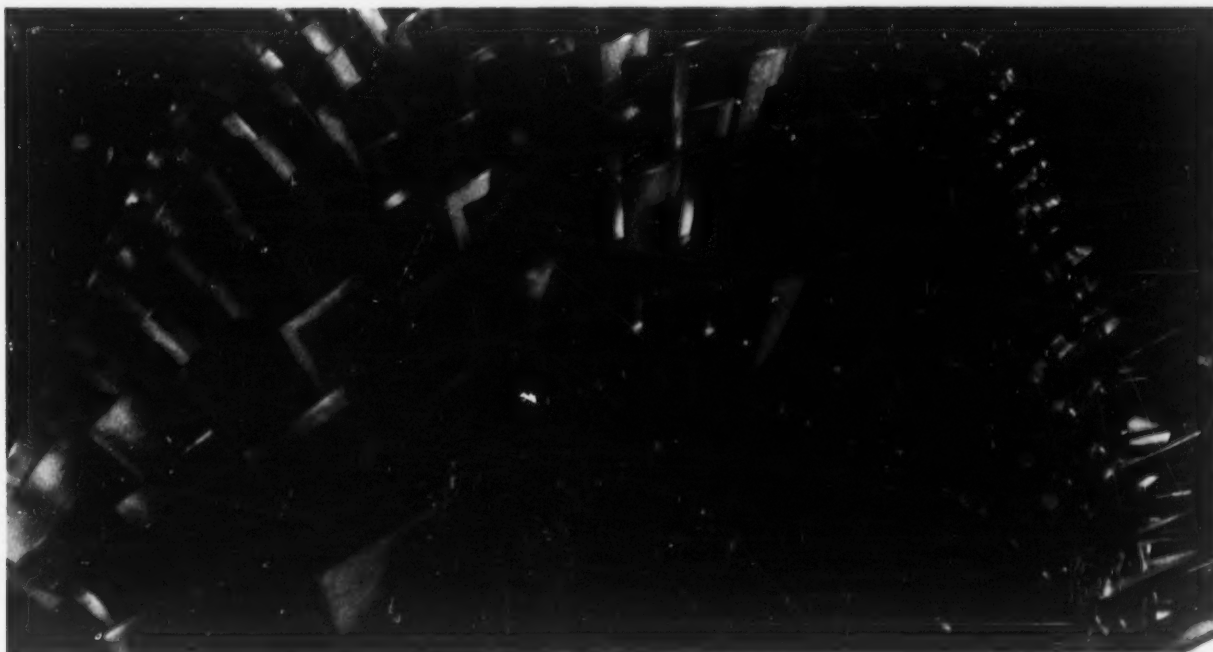
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THE COVER

This issue's focus on power and steam includes an analysis of considerations for upgrading steam turbines at pulp and paper mills, as well as discussions on recovering steam from thermomechanical pulping systems and methods of reducing boiler downtime (photo courtesy of G.E. Power Generation, Schenectady, N.Y.).

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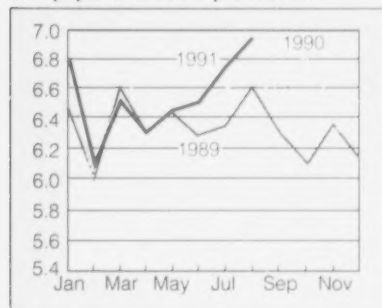
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U.S. paper and board production



U.S. production of paper and paperboard totaled 7.0 million tons in August, up 3.2% from the same month last year, according to the American Paper Institute. The rising trend evident early last summer continued through August, keeping the seasonally adjusted two-month moving average above 81 million tpy. Strength was concentrated in the paperboard sector, with paper unchanged from last year's rate.

Among major grades, printing and writing shipments continued to rebound after bottoming out in March. Uncoated free-sheet recovered almost 17% from its March low thanks to recent support from commercial printers, reprographics users, and forms converters. Containerboard output for domestic use was up 0.4% through August, while production for export rose 16.2%. Boxboard production was up 6.3% for the domestic market and 9.8% for export, thanks in part to Mead's new machine at Mahrt, Ala.

Canadian newsprint shipments totaled 731,000 metric tons in August, down 2.5% from July 1990. Newsprint mills operated at 84% capacity, down from 90% last year. Woodpulp shipments climbed 6.5% to 673,000 tons, as operating rates rose from 84% last year to 90% in August 1991. ■

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Aug.	580	1.4	6,819	4.2
Uncoated groundwood (s)	Aug.	152	3.4	1,760	-1.4
Coated paper (s)	Aug.	656	-3.0	7,214	-3.8
Uncoated free-sheet (s)	Aug.	1,057	4.5	11,456	-0.7
Other printing/writing	Aug.	126	-8.0	1,470	-6.9
Total packaging and other paper (s)	Aug.	385	-2.3	4,632	-0.9
Tissue	Aug.	484	-3.4	5,694	-1.3
Total paper	Aug.	3,439	0.0	30,946	-0.8
Unbleached kraft paperboard	Aug.	1,864	8.2	20,651	2.6
Semichemical medium	Aug.	477	-0.2	5,670	-0.6
Bleached paperboard	Aug.	389	7.5	4,617	3.3
Recycled paperboard	Aug.	792	6.6	8,970	-0.3
Total paperboard	Aug.	3,622	9.6	39,908	1.6

Total U.S. paper and paperboard output	Aug.	6,961	3.2	78,854	0.4
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	July	5,631	2.6	63,826	1.8
Market pulp production	July	793	0.6	9,076	3.5
Wastepaper consumption at paper/board mills	July	1,801	3.6	21,287	2.7
Pulpwood consumption (cords)	July	8,239	-2.7	96,892	-0.3

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Aug.	28,297	-0.1	212,875 ⁴	-1.0
Containerboard inventories at U.S. box plants and mills	July 31	2,706	2.0		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	July	951	-12.4	12,043	-9.0
Imports of Canadian newsprint	July	580	-15.8	7,657 ⁴	-10.6
U.S. paper exports (including products)	July	660	21.3	8,203	20.9
Exports of unbleached kraft linerboard	July	224	-0.9	3,037	13.0
Exports of woodpulp	July	497	5.5	6,402	9.2
Norcan pulp inventories ⁴	Aug. 31	1,745	3.7		
Norcan pulp operating rates ⁴	Aug.	87%	84%	87%	87%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Aug.	731	-2.5	5,798 ⁶	-7.1
Operating rates	Aug.	84%	90%	88%	94%
Inventories held by U.S. consumers	Aug. 31	1,454	5.3		
Other paper/board shipments	Aug.	658	-2.1	4,865	-2.3
Woodpulp shipments (export only)	Aug.	673	6.5	5,513	9.5
Operating rates	Aug.	90%	84%	89%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn. Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Newsprint: Markets hammered by combination of overcapacity, lower consumption, high inventories

Grade Structure: Daily newspapers use approximately 75% of all newsprint consumed in the U.S., with about 55% of total supply coming from Canada and 45% produced domestically. While newsprint has found greater use in weekly newspapers and commercial printing, consumption by daily newspapers in 1991 continued to be plagued by a slump in advertising tied to the general economic recession but also to fundamental changes in newspaper readership.

Production/capacity: The newsprint market in 1991 was generally shaped by an onslaught of new capacity, in the form of five new machines, and a disastrous mix of lower consumption and stubbornly high inventories. With North American capacity increasing by about 500,000 metric tons in 1991, and consumption down about 8% through the first nine months of the year, producers were left with the choice of raising price discounts to unprofitable levels or curtailing production, and, in many cases, they did both. Morgan Stanley estimated that, while North American newsprint supply increases at a 3.2% annual rate over the 1988-92 period, U.S. consumption will decline at an annual rate of 0.9%. Operating rates were expected to decline to about 88% in 1991 compared with 93% in 1990, and little improvement is anticipated for 1992 and 1993.

Many industry observers concluded that perhaps as much as 2 million metric tons needed to be taken off the market in 1991, but downtime through the first nine months of the year eliminated only half as much as needed. Producers instead increased price discounts in a pitched battle to remain in operation.

Producers have seen their profit margins fall from 20% in 1988 to 3% in 1990, with Canadians operating at break-even levels in 1991. On-hand supplies of newsprint at U.S. publishers were beginning to show a gradual decrease in the third quarter, dropping from about 50 days in June to 43 days in September, according to the Canadian Pulp & Paper Assn. (CPPA), but stockpiles at Canadian mills remained at record levels through most of the year.

Many producers hoped that a strike by British Columbia paperworkers would bring some relief, but the current contract was extended ten months. Customers who built up inventories in anticipation of a labor disruption were hard pressed to reduce them.

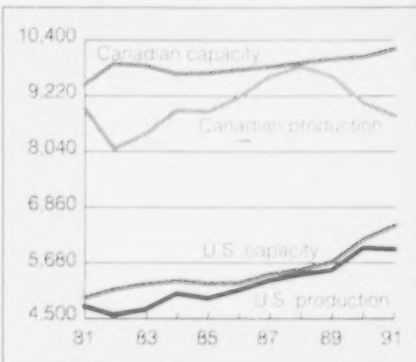
Despite the domestic market woes, Canadian shipments to markets other than the U.S. were up 21.9% to 1.5 million tons through the first nine months of the year, while U.S. shipments were up 33.1%, CPPA reported.

Outlook: Many major buyers said in the third quarter of 1991 that newsprint orders for 1992 would equal orders for the previous year, indicating that not much improvement in the business is anticipated. Buyers usually overestimate consumption in these projections, however, so a status quo scenario can also be construed as a ominous forecast that newsprint consumption may not recover at all in 1992. Profound changes are expected in the Canadian newsprint sector, with high-cost mills and machines facing permanent shutdown or conversion to value-added paper grades. Despite closures and conversions, the growth of recycled newsprint will somewhat offset further reductions in capacity.

Pricing: Following the failure of an attempted price hike in January 1991, newsprint prices deteriorated throughout the year. The sinking eastern market dragged down prices in the West, as discounts increased gradually for big, medium, and small customers alike. By September, many buyers were reporting discounts of about 30%, even on contract tonnage, while spot deals on lower-quality paper approached 40%.

Through 1992, producers will be more concerned with lowering discounts as market forces prohibit the possibility of an actual price increase until 1993. List price history is as follows (U.S. East, contract, year-end, per metric ton): 1976-\$314; 1977-\$331; 1978-\$353; 1979-\$413; 1980-\$441; 1981-\$500; 1982-\$468; 1983-\$500; 1984-\$535; 1985-\$535; 1986-\$500; 1987-\$570; 1988-\$650; 1989-\$650; 1990-\$685; 1991-\$685.

SUPPLY/DEMAND (000 metric tons)



FORECAST (000 metric tons)

U.S.	1989	1990	1991e
Production	5,523	5,996	5,965
Capacity	5,712	6,194	6,484
Utilization rate	96.7%	96.8%	92.0%
Apparent U.S. consumption	12,245	12,125	11,519
lb/capita	108.7	108.3	101.3
GNP ratio ¹	3.26	3.22	3.07

Canada	1989	1990	1991e
Production	9,640	9,068	8,795
Capacity	10,020	10,070	10,229
Utilization rate	96.2%	90.1%	86.0%

e = Pulp & Paper estimate.
1. 1,000 tons/\$ billion real GNP

TOP NORTH AMERICAN PRODUCERS

Company	Annual capacity ¹		Market share	
	U.S.	Canada	Total	(%)
1. Abitibi-Price ²	550	1,510	2,060	12.3
2. Canadian Pacific ³	210	1,540	1,750	10.5
3. Bowater ⁴	1,275	240	1,515	9.1
4. Fletcher Challenge	—	1,140	1,140	6.8
5. Stone Container ⁵	275	845	1,120	6.7
6. Kruger ⁶	—	1,020	1,020	6.0
7. Boise Cascade	535	305	840	5.0
8. Champion	815	—	815	4.9
9. Quebec & Ontario	—	765	765	4.6
10. North Pacific ⁷	705	—	705	4.2

Market share of top five companies:

45.4%

Market share of top ten companies:

70.2%

Total North American capacity (1991):

16.71 million metric tons

1. All figures are in metric tons. 2. Includes joint ventures at Claiborne, Ala., Augusta, Ga., and Chandler, Que. 3. Includes 40%-owned Ponderay Paper Co. in U.S. Wash. 4. Includes East Millinocket, Maine, mill to be acquired from Georgia-Pacific Corp. 5. Includes Crown Forest Industries mill in Campbell River, B.C. 6. Improved from No. 9 in 1990 to No. 6 in 1991 with the startup of a new machine at Trois Rivières, Que. 7. Includes new machine started up in September 1991.

SALES AND EARNINGS

North American earnings plunge again

Growing capacity in the face of anemic demand contributed to another decline in corporate earnings for North American paper products companies during the quarter ending in September, as prices were sharply lower, with uncoated free-sheet and market pulp particularly hard hit. A *Pulp & Paper Week* survey of 30 U.S. forest products manufacturers shows third-quarter sales declined 3.5% to \$23.3 billion compared with the same period last year. Earnings (adjusted for major nonrecurring items) of \$534 million were off 53%. A separate survey of Canadian manufacturers again showed a significant quarterly loss.

There appear to be better times ahead for some in the U.S. as price increases have been implemented in recent months for several grades, including uncoated free-sheet, containerboard, bleached board, tissue, and even market pulp. A strong industry recovery, however, is not in the cards until the general economy shakes off its recessionary blues. And producers of certain grades, particularly newsprint, are going to have an especially hard time stemming price erosion due to excessive capacity additions and apparent structural changes on the demand side.

International Paper Co. once again topped the industry in terms of revenue, achieving a \$3.28-billion tally. Third-quarter earnings of \$109 million, however, were only enough for the number two spot (behind Kimberly-Clark Corp.) and were down 40% from year-ago results. According to the Deutsche Bank Group, a seasonal deterioration of profitability at IP's European operations (about 20% of 1990 sales) was part of the reason for the decline. On a more positive note, the bottom-line tally did show a slight improvement over profits (\$104 million) in the quarter ending in June, as the containerboard group enjoyed improved pricing and sales volume, and a price increase for uncoated papers helped stem a revenue drop caused largely by significant industry capacity increases.

Heavily-leveraged Georgia-Pacific Corp. reported a net loss of \$15 million for the three months ended Sept. 30, 1991, compared with a net income

of \$95 million in third-quarter 1990. The latest-quarter results do not include a \$12-million after-tax loss accrual for the anticipated sale, for \$300 million, of an 80% stake in the company's Great Northern Paper Inc. operations. More importantly, from G-P's perspective, the company was able to generate \$140 million in "free cash flow." It achieved this, in part, by keeping capital expenditures at \$85 million, less than 3% of sales.

The third largest of the diversified paper and forest products companies, Weyerhaeuser Co., suffered a 44% drop in profits to \$50.4 million. Most of the damage was inflicted by a 62% decline in operating earnings, to \$49 million, at its pulp and paper businesses. The falloff occurred due to depressed pricing combined with disappointing volume, as the company took heavy downtime for scheduled maintenance and because of weak market conditions. The forest products segment enjoyed somewhat more success with operating earnings at \$71 million, up 60% year to year.

Burnell Roberts, Mead Corp. chair-

man and CEO, reported that the expanded coated board mill at Mahrt, Ala., achieved record operating rates in the third quarter. Positive news was also forthcoming from the company's school and office products business and its electronic publishing operations. Mead Data Central, which put through an August price hike and reaped the benefits from cost reduction programs. But these factors were outweighed by low prices for pulp, paper, and containerboard, as well as reduced sales at Mead's packaging and industrial supplies distribution business (Zellerbach). Looking ahead, price increases for coated board, corrugating medium, and uncoated paper provide room for optimism, but as Roberts cautioned, Mead's coated board and school and office supplies businesses are seasonally weaker in the coming quarters.

Tough times. Despite a price hike on containerboard late in the period, the third quarter was not an easy time for the nation's boxmakers. Stone Container Corp. reported a net loss of \$13.4 million in third-quarter 1991 vs



Fire fighters douse an afternoon blaze Oct. 8 at Garden State Paper Co.'s recycled newsprint mill in Garfield, N.J. A gas explosion at the mill's power plant disrupted production for more than ten days, causing more than \$1 million in damage. No employees were hurt in the incident, which also temporarily halted collection of old newspapers from 140 communities in the U.S. Northeast (Photo courtesy of *The Record*, Hackensack, N.J.).

a \$19.7-million gain in the year-earlier quarter. But, citing data reported by the American Paper Institute, Roger Stone, chairman and CEO, noted that the company's most important business, containerboard/corrugated boxes, "emerged from the recession during the third quarter with total containerboard production of 7,104,000 tons, 4% ahead of 1990 and 8% above the previous quarter."

Temple-Inland Inc., though helped by continued tax breaks related to its financial services division, saw net income tumble 43% to \$32 million, due to lower box and market pulp prices, as well as a scheduled major rebuild of the primary recovery boiler at its Evadale, Texas, mill. Meanwhile, Union Camp Corp., which is being hurt by its exposure to uncoated free-sheet, fared marginally better, only with the help of greater-than-normal income from land sales and real estate activities (approximately \$7 million).

Boise Cascade Corp. posted another heavy loss as its paper and paper products segment continued to flounder. Third-quarter earnings, excluding nonrecurring items, sunk to a \$49.4-million deficit compared with a \$13.9-million gain in the year-earlier period and a \$32.6-million loss in second-quarter 1991. Most of the damage was caused by lower paper prices and escalating wood costs in the Pacific Northwest. Adding to Boise's troubles, the company's aggressive capital expansion program has led to rapidly increasing interest costs, \$130 million vs \$80 million in the previous year. Boise's newsprint operations (about 930,000 tpy) may have to wait a while longer for relief. Newsprint woes, in large part, caused Bowater Inc.'s earnings to fall to \$7 million in the period, 70% below the same quarter a year earlier, and 65% shy of second-quarter profits (excluding a \$9-million extraordinary charge). Bottom lines of other major white paper manufacturers also showed the strain of unfavorable market conditions. Champion International Corp. came in just below break-even before taking into account a net nonrecurring gain of \$11 million. And Consolidated Papers Inc. struggled with third-quarter net income slipping 42% from year-earlier levels to \$19.8 million. Consolidated was hurt as the weak economy, combined with a continuing slump in magazine advertising, led to curtailed production and price erosion in the

U.S. paper/products industry results.

Companies	Third quarter 1991 (\$000)			
	Sales 1991	% change 1991/90	Earnings 1991 ¹	% change 1991/90
Badger Paper Co. Inc.	\$17,562	-10.6%	\$1,136	61.1%
Boise Cascade Corp. ²	1,016,690	-3.5	(49,379)	NM
Bowater Inc.	311,954	-10.0	7,052	-70.2
Champion International Corp. ³	1,228,303	-5.1	(582)	NM
Chesapeake Corp.	219,456	1.6	4,840	60.8
Consolidated Paper Inc.	217,164	-8.0	19,771	-41.6
Federal Paper Board Co. Inc. ⁴	341,800	15.3	24,200	10.5
Fort Howard Corp. ⁵	298,685	-0.4	(19,853)	NM
Georgia-Pacific Corp. ⁶	2,973,000	-13.3	(15,000)	NM
P.H. Glatfelter Co.	142,101	-6.3	17,370	-13.9
International Paper Co.	3,277,000	0.3	109,000	-39.8
James River Corp. ⁷	1,118,814	-13.4	8,467	-85.5
Kimberly-Clark Corp.	1,694,600	7.6	126,100	2.3
Longview Fibre Co. (7/31)	161,320	-6.5	4,523	-73.1
Louisiana-Pacific Corp.	449,500	-0.3	26,500	25.0
Mead Corp. ⁸	1,210,800	-4.5	25,300	-44.5
Mosinee Paper Corp.	51,894	0.3	1,769	-46.9
Pentair Inc.	300,567	0.0	11,193	18.4
Pope & Talbot Inc. ⁹	124,013	-12.0	(735)	NM
Potlatch Corp.	322,922	2.8	18,220	-26.2
Scott Paper Co. ¹⁰	1,210,200	-9.0	28,000	-56.8
Sonoco Products Co. ¹¹	420,766	1.3	25,108	-2.8
St. Joe Paper Co.	144,015	-3.6	4,347	-50.1
Stone Container Corp.	1,362,800	-4.6	(13,400)	NM
Temple-Inland Inc.	641,500	6.1	32,000	-43.4
Union Camp Corp. ¹²	768,624	8.6	26,719	-48.2
Wausau Paper Mills Co. (6/31)	91,520	7.1	14,166	100.9
Westvaco Corp. (7/31)	564,579	-4.8	37,447	-21.2
Weyerhaeuser Co.	2,213,449	-2.2	50,404	-44.3
Willamette Industries Inc.	504,979	4.4	13,579	-56.6
Total	\$23,400,597	-3.5%	\$538,262	-53.0%

1. Income after taxes, from continuing operations. () = losses. NM = not meaningful. 2. **Boise Cascade:** 1991 earnings do not include \$35.1-million net nonrecurring gain associated with a \$62.6-million pretax gain from sale of timberland and \$15.2-million pretax "reserve" related to anticipated costs of the divestiture of certain assets. **Champion International:** 1991 earnings do not include net nonrecurring gains of \$11.1-million (or \$18-million pretax), mostly related to timberland sales. **Federal Paper Board:** Results are for 12 weeks ended 9/7/91 and 9/8/90. **Fort Howard:** 1991 earnings do not include a \$4.9-million extraordinary loss related to the repurchase of long-term debt. **Georgia-Pacific:** 1991 earnings do not include \$12-million aftertax loss accrual for anticipated sale of 80% stake in Great Northern Paper Inc. **James River:** 1990 earnings do not include a \$143.6-million restructuring charge. **Mead:** 1990 earnings do not include a net extraordinary credit of \$6.1-million and losses from discontinued operations of \$5.9-million. **Pope & Talbot:** 1991 earnings do not include a \$469,000 restructuring gain. **Scott Paper:** 1991 results do not include businesses to be divested. **Sonoco Products:** 1990 earnings do not include charge of \$54.7-million for restructuring costs. **Union Camp:** 1991 earnings do not include greater than normal income from land sales and retail activity which added about \$7 million to net income.

lightweight coated paper markets.

Kimberly-Clark has been the biggest success story among the majors in the paper industry in 1991. Third-quarter 1991 earnings advanced to \$126.1 million, higher than year-earlier and second-quarter profits by 2.3% and 2.4%, respectively. The year-to-year progress was achieved as improved sales volume, increased productivity for some product lines, lower purchased pulp prices, and a 2.7% drop in the effective tax rate more

than offset lower newsprint pricing and rising marketing costs. The recent jump in marketing expenses reflects, in large measure, aggressive promotion of "new or improved" consumer products as K-C muscles additional market share to accommodate recent increases in capacity.

James River Corp., on the other hand, is struggling. Its third-quarter net income, adjusted for nonrecurring items, was down compared with the year-earlier and June 1991 periods by

86% and 63%, respectively. The main culprits have been depressed prices for printing/writing papers, in addition to aggressive promotional budgets in the consumer products sector.

Scott Paper Co. has yet to show any dividend from the restructuring plan it initiated at the end of 1990. Scott's domestic (consumer) tissue operations suffered a 33% drop in year-

to-year third-quarter income, due, in part, to higher marketing costs. But the main burden has been the dismal performance at Scott's S.D. Warren Co. printing and publishing papers unit. Scott Paper's overall net income plummeted to \$28 million in third-quarter 1991, down from year-earlier and second-quarter results by 57% and 8%, respectively. ■

Canadians post massive losses

Corporate profits in the Canadian forest products industry continued to slide in the third quarter as newsprint and pulp prices spiraled down. Exacerbating the industry's woes, the brief second-quarter recovery in the lumber and building materials markets was reversed. A *Pulp & Paper Week* survey of 14 companies shows a net loss tally, excluding nonrecurring items, of C\$206 million for the three months ending Sept. 30, 1991. In comparison, this same group posted a net deficit of C\$31 million in the same

period in 1990. Despite some announced price increases for market pulp, heavy losses are expected to continue in the fourth quarter.

The collapse of newsprint pricing continues to severely undermine profitability of the eastern Canadian producers. Abitibi-Price Inc. reported a C\$16.6-million net deficit in the third quarter, its worst quarterly results of the year. Hurt by the price pressures, all of the company's major primary paper businesses, including newsprint and groundwood and coat-

ed papers, suffered operating losses. The country's second largest newsprint manufacturer, Canadian Pacific Forest Products Ltd., fared no better, reporting a C\$55.2-million loss from continuing operations, roughly on par with second-quarter period results. The company was hurt by continued weak selling prices and reduced shipments, particularly in newsprint and market pulp, as well as rising interest expenses due to increased borrowing. Reported net income was close to break-even, however, as the company booked a C\$54-million gain on the sale of its tissue subsidiary, Facelle Co., to Procter & Gamble Co. Proceeds from the sale, which totalled C\$186.4 million, were used to reimburse indebtedness. Even so, steady operating losses and a relatively heavy capital expenditure program, which had rung up a C\$327-million tab through the first nine months of 1991, have been wearing away at CP Forest's balance sheet. The company reported that at Sept. 30, 1991, debt represented 41% of total capital compared with 30% just one year earlier.

Even Donohue Inc., perhaps the lowest-cost newsprint producer in Canada, reported a sizable C\$14.4-million shortfall at the bottom line for the three month period. The bulk of the deficit was caused by an C\$11.9-million loss associated with the company's 50% ownership of Donohue Matane Inc., operator of a 190,000-metric-tpy bleached chemi-thermo-mechanical pulp (BCTMP) mill. Donohue Matane, which is co-owned by Donohue and Rexfor, a Quebec government agency, has since closed the pulp mill and related sawmills indefinitely. Consequently, Donohue's fourth-quarter results will almost certainly include a full or partial write-off of the company's C\$40.4-million investment in Donohue Matane.

Noranda Forest Inc. reported a C\$51-million loss in the September quarter vs deficits of C\$40 million and C\$42 million in the year-ago and June 1991 periods, respectively. Almost C\$15 million of the loss is attributable to the company's equity stake in MacMillan Bloedel Ltd. K. Linn Macdonald, President and CEO of Noranda Forest Inc., described current market conditions as "the most difficult in recent memory, with the hoped-for recovery deferred at least until next spring." Macdonald added that Noranda was implementing cost-containment measures and would sell

Canadian paper industry results.

Companies	Third-quarter 1991 (C\$000)			
	Sales 1991	% change 1991/90	Earnings 1991 ¹	Earnings 1990
Abitibi-Price Inc. ²	C\$692,300	-8.5%	(16,600)	(700)
Canadian Pacific Forest Products Ltd. ²	499,400	-8.5	(55,200)	(900)
Canfor Corp. ²	205,900	4.7	(31,800)	(13,700)
Cascades Inc. ²	195,203	-7.0	C\$3,980	C\$6,959
Crestbrook Forest Industries Ltd. ²	41,309	-19.6	(3,561)	3,590
Doman Industries ²	120,165	-17.7	(16,800)	(9,213)
Domtar Inc. ²	454,000	-20.9	(39,000)	(21,000)
Donohue Inc.	103,300	-25.6	(14,400)	5,300
Fletcher Challenge Canada Ltd.	251,600	-1.5	(16,300)	4,000
MacMillan Bloedel Ltd.	665,300	-7.5	(29,500)	6,200
Noranda Forest Inc.	1,022,000	-5.2	(51,000)	(40,000)
Perkins Paper Ltd.	19,340	0.6	1,093	1,062
Repap Enterprises Inc.	262,500	-18.5	(41,900)	4,500
Rolland Inc. ²	71,658	-27.3	(2,536)	(831)
Scott Paper Ltd.	110,826	-10.1	3,532	3,833
Slocan Forest Products	50,200	11.3	(4,200)	(1,300)
Weidwood of Canada Ltd.	159,900	-4.5	(9,000)	1,000
West Fraser Timber Co.	146,500	8.1	(3,900)	(1,200)
Totals²	C\$4,406,101	-9.4%	C\$(312,342)	C\$(55,500)

1. Income after taxes, from continuing operations. 2. **Abitibi-Price:** 1990 results are restated. **Canadian Pacific Forest Products:** Does not include gains from discontinued operations (Facelle Co.); 1991 \$54.2 million. **Canfor:** 1991 earnings do not include \$2.7-million restructuring/rationalization charge. **Cascades:** 1991 and 1990 (restated) earnings do not include respective \$12.3-million and \$2.5-million losses related to discontinued operations (Port Cartier, Que., BCTMP mill). **Crestbrook Forest:** 1991 earnings do not include an inventory revaluation charge of \$4.2-million and an initiative fee gain of \$5.6-million. 1990 earnings do not include a \$200,000 inventory revaluation charge. **Doman:** 1991 earnings do not include \$7.9-million gain related to South Moresby settlement. **Domtar:** 1990 earnings do not include \$1-million loss from discontinued operations. **Rolland:** 1990 earnings exclude a \$6.6-million nonrecurring charge. **Totals:** Noranda Forest, which has a roughly 50% stake in MacMillan Bloedel, accounts for MB as a consolidated affiliate. Accordingly, to avoid double counting, MB's sales and half of its earnings are excluded from the totals line. () = losses

assets as it became necessary "to ensure that the company was well positioned to benefit when the market recovers."

The western Canadian companies, which tend to focus on market pulp and lumber as well as newsprint, fared no better than their eastern counterparts. With year-to-year third-quarter sales slipping 7.5% to C\$665 million, MacMillan Bloedel reported a net loss of C\$29.5 million, compared with a C\$6.2 million gain and an C\$11.3 million loss in the year-ago and June 1991 periods, respectively. The company attributed the deteriorating results to a sharp fall in the price of newsprint, adding that operating rates at its mills were less than 80% due to the continuing decline in newsprint consumption in the U.S., especially west of the Rockies. Pulp prices were also lower, and MB has taken, and continues to take, significant downtime to reduce inventory

levels.

The only companies in the Canadian paper industry reporting positive net income during the third quarter were two tissue manufacturers, Perkins Papers Ltd. and Scott Paper Ltd. Despite very competitive tissue market conditions, Perkins, which makes 100% recycled paper products, managed to earn C\$1.1 million in the third quarter, up 3% from year-ago profits, and 12% higher than second-quarter profits. In addition, the company reported that its new 28,000-metric-tpy machine at Candiac, Que., started up on Oct. 12 and "progresses well". Scott Paper Ltd. tallied earnings of C\$3.5 million, down 8% from the year-ago period but up 10% from the June 1991 quarter. The company noted that strong cost performance at all manufacturing locations and lower raw material costs (i.e., market pulp) offset the negative impact of excess industry capacity and a slow economy. ■

to the company's unit in Calhoun, Tenn., which uses 70% ONP and 30% OMC. It is also likely that the resulting deinked fiber will be designated for East Millinocket.

Expanding coated capacity. When market conditions improve, Bowater also intends to increase lightweight coated (LWC) paper capacity and production. Don D'Antuono, Bowater's vice president for corporate development, said the project could be a new machine or conversion of existing capacity. The machine probably would be designed with a capability of producing ultra-lightweight coated grades under 32 or 30 lb, something the company's Catawba, S.C., mill is unable to do with southern pine fiber. Currently, that mill is running 36- to 40-lb paper, though a number of trials have been made on lighter basis weights, a source from the company said.

Millinocket has five operating machines, three dedicated to coated groundwood papers, Manuel said. One of those machines has an on-machine coater, and an off-machine blade coater uses basestock from the other two. The remaining machines make mostly uncoated groundwood specialties but have also been used to make newsprint when market conditions warranted. The East Millinocket mill has been running two newsprint machines in addition to a directory paper machine.

Modernization long studied. For a number of years, GNP had been studying ways to make the two Maine mills more competitive in cost and quality. The joint study between Bowater and G-P followed a cancelled proposal for a greenfield LWC mill in a venture between GNN and MD Papier GmbH of Germany. Plans for the \$484-million project at Millinocket collapsed when G-P bought out GNN. Great Northern's initial capital plans for the two mills called for a \$2.5-billion investment, which included a new LWC paper mill, a new kraft pulp mill, and the conversion of the existing Millinocket groundwood papers mill.

The two largest newsprint machines at East Millinocket were rebuilt with twin-wires in 1987 at a cost of more than \$150 million. A new LWC machine at Millinocket would probably come online in about two to three years, perhaps about the same time as the postponed 318,000-tpy machine Boise Cascade Corp. plans

MERGERS AND ACQUISITIONS

G-P inks joint venture deal with Bowater

Bowater Inc. said it will pay \$300 million in cash for an 80% interest in Georgia-Pacific Corp.'s Great Northern Paper Inc. (GNP) unit's newsprint and groundwood paper mills in Millinocket and East Millinocket, Maine. Also included in the deal are hydroelectric assets that power the mills, the Pinkham Lumber Co. at Ashland, Maine, and about 2.1 million acres of associated timberland. G-P acquired GNP when it purchased Great Northern Nekoosa Corp. last year. Sale completion is dependent upon approval by appropriate federal and state regulatory agencies but is expected to take place by the end of the year.

"Great Northern's products and markets are almost totally complementary to Bowater's," said A.P. Gammie, Bowater's chairman and CEO, in late October. "We are strong in newsprint except in New England, which is GNP's major market, and in lightweight coated groundwood papers. All our history has been in groundwood-based papers, and we have the technical expertise and market support to develop the GNP mills' assets," he added. "With their northern fiber timberlands, hydroelectric power, and highly skilled work force, we believe there is a very good fit to

be obtained between the Millinocket mills and our mills in eastern Canada and the U.S."

Under this agreement, Bowater will manage GNP, and the company also has the option to purchase the remaining 20% interest for \$22 million in the future. G-P has the right to require Bowater to make that purchase after June 30, 1992. Bowater explained that the recent purchase agreement grew out of joint development studies of the former GNN properties announced last year by Bowater and G-P.

Bowater will proceed with plans to install a recycling deinking plant for newspaper and directory papers at East Millinocket, something Great Northern Paper has been planning for some time, said GNP spokesperson Gordon Manuel. GNP had sought permits for a deinking plant last year. The permit application called for a \$47-million, 500-tpd deinking plant that would use about 100,000 short tpy of old newspapers (ONP) and old magazines (OMG). Originally, the start-up was planned for late 1992 with initial capacity of 250 tpd. The resulting newsprint product would have 40% recycled-fiber content. GNP was awarded those permits this past June. The deinking plant is likely to be similar

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This issue's Outlook '92 (p. 52) and Capital Spending (p. 89) reports analyze the beginnings of a turnaround for both U.S. and Canadian paper industries. However, the recovery is expected to be slow through 1992 without a full recovery until 1993. (Photo courtesy of Georgia-Pacific Corp., all rights reserved).

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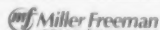
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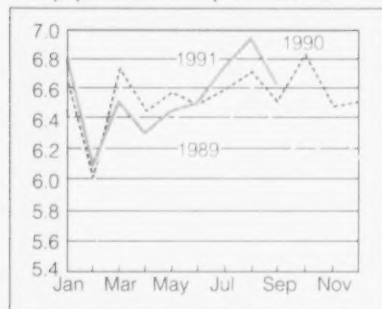
IP moves buying binge to Pacific

Swedish profits drop

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MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.6 million tons in September, up 1.8% from the previous year, according to the American Paper Institute (API). The seasonally adjusted rate of production stood at 78.8 million tpy through the first nine months, up 0.5% from the same period in 1990. Paperboard production climbed 1.7% to a 39.8 million tpy rate, while paper output dropped 0.7% to 39.0 million tpy. The third quarter was strong for both sectors, helping to offset weakness early in the year for the paper grades and during the summer for paperboard.

Among major grades, printing and writing papers showed no change from 1990, as recent strengthening has not yet offset a poor showing in the first quarter. API points out that new orders have exceeded shipments since April, however, and that unfilled orders for uncoated free-sheet have increased sharply. Exports continued to buoy the linerboard sector, rising 18.3% above 1990. Production for the domestic market was up 2.2% in the third quarter, but only 0.6% through September.

Canadian newsprint shipments totaled 698,000 metric tons in September, unchanged from a year earlier, while market pulp shipments rose 11.1% to 642,000 tons. Operating rates dropped to 88% at newsprint mills and 75% at pulp plants for the first nine months.

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION¹					
Newsprint	Sept.	547	-0.4	6,791	3.7
Uncoated groundwood (s)	Sept.	155	13.1	1,772	-0.2
Coated paper (s)	Sept.	637	0.2	7,264	-3.3
Uncoated free-sheet (s)	Sept.	981	5.7	11,491	0.0
Other printing/writing	Sept.	127	-3.1	1,477	-6.5
Total packaging and other paper (s)	Sept.	356	-7.0	4,465	-2.4
Tissue	Sept.	465	-4.5	5,681	-1.7
Total paper	Sept.	3,267	0.5	38,940	-0.7
Unbleached kraft paperboard	Sept.	1,768	4.0	20,714	2.8
Semichemical medium	Sept.	461	1.3	5,655	-0.4
Bleached paperboard	Sept.	368	1.4	4,595	3.1
Recycled paperboard	Sept.	758	2.6	8,984	-0.2
Total paperboard	Sept.	3,356	3.0	39,948	1.7
Total U.S. paper and paperboard output	Sept.	6,623	1.8	78,888	0.5

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Aug.	5,133	-4.3	63,594	1.2
Market pulp production	Aug.	688	-15.9	9,000	1.3
Wastepaper consumption at paper/board mills	Aug.	1,854	0.5	21,624	3.2
Pulpwood consumption (cords)	Aug.	8,419	1.0	99,159	-0.2

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Sept.	31,334	1.9	271,378 ⁶	0.0
Containerboard inventories at U.S. box plants and mills	Aug. 31	2,539	-1.2		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Aug.	1,005	-7.7	12,045	-8.9
Imports of Canadian newsprint	Aug.	606	-9.7	7,621 ⁶	-10.5
U.S. paper exports (including products)	Aug.	746	23.7	8,297	21.3
Exports of unbleached kraft linerboard	Aug.	258	12.2	3,044	12.9
Exports of woodpulp	Aug.	565	2.0	6,534	8.9
Norscan pulp inventories ⁴	Sept. 30	1,469	-1.7		
Norscan pulp operating rates ⁴	Sept.	74%	89%	84%	86%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Sept.	698	0.0	6,497 ⁶	-6.3
Operating rates	Sept.	86%	77%	88%	92%
Inventories held by U.S. consumers	Sept. 30	1,411	6.4		
Other paper/board shipments	Sept.	642	11.1	5,514	-0.8
Woodpulp shipments (export only)	Sept.	766	23.9	6,280	11.1
Operating rates	Sept.	75%	87%	75%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn.
Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp.
5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) — Shipments.

Kraft linerboard: High operating rates if U.S. economy begins to strengthen

Grade structure: Unbleached kraft linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000 ft². Major end use is in domestic corrugated container production, although about 15% of output is exported.

Regular unbleached kraft accounts for the bulk of U.S. linerboard production, but white-surface, high-performance and recycled grades have been showing faster growth. White-surface linerboard output last year totaled more than 1.3 million tons and has been growing about 7%/year. Recycled linerboard production last year was about 600,000 tons but is expected to more than double over the next several years due to increased interest in recycling. High-performance grades are being spurred by changes in Rule 41 freight classifications and need for boxes offering higher compression strength.

Production: U.S. linerboard production held up well through last year's economic downturn thanks to strong export demand. Linerboard production for the domestic corrugated box market was down about 1% due to almost no growth in corrugated box shipments. But exports surged about 18% to nearly 3 million tons, an all-time high, according to American Paper Institute (API) statistics. For all of 1991, linerboard output will increase an estimated 1.3% to a record 19.2 million tons. Linerboard mills' operating rates for the year averaged about 96%—not bad for a recession year.

Containerboard inventories at box plants and mills dropped from a peak of 3.1 million tons (6.7 weeks) at the end of February 1991 to 2.46 million tons at the end of October (4.8 weeks)—a decline of 645,000 tons. Although expected to rise with the normal slowdown in box plant activity in December, inventories will start the new year considerably below their level at the beginning of 1991.

Capacity trends: Linerboard capacity will show only modest growth over the next several years, according to the new API capacity survey released

in December. Kraft linerboard capacity is expected to increase only 1.6% in 1992 following 1.2% growth in 1991 and will show no increase in 1993.

Recycled linerboard capacity, however, is expected to show more dramatic growth, rising from 673,000 tons in 1991 to 848,000 tons in 1992 and 1.45 million tons by 1993. With the inclusion of recycled capacity, total U.S. linerboard capacity is expected to rise 2.1% in 1991, 2.4% in 1992, and 2.9% in 1993.

Outlook: With any growth in corrugated box shipments and limited growth in new capacity, linerboard producers will enjoy relatively high operating rates in 1992. Corrugated box shipments are only projected to grow about 3.5% this year in what is expected to be a slower than normal economic recovery. Meanwhile, U.S. linerboard export shipments are expected to show about 4% growth, with increased demand from Asia and Latin America offsetting any dropoff in orders from Europe.

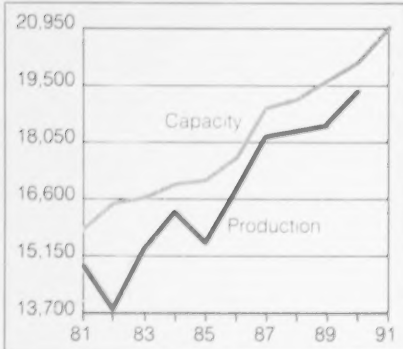
Total U.S. kraft linerboard production is expected to increase 3.6% to a record 19.9 million tons. This would result in operating rates of 97-98% for kraft linerboard mills (or 96-97% if recycled mills are included).

Prices: Improving market conditions enabled linerboard producers to push through a \$30/ton price increase last fall bringing the transaction price in the eastern U.S. to \$350/short ton. This reversed a nearly two-year slide in prices from the former list of \$410, first established in the spring of 1988.

Some producers may try to get the price back up to the former list level with a \$30/ton price increase this spring, followed by another \$30/ton increase in the fall. Sluggish U.S. economic conditions and some possible weakening in export markets, however, make success of a spring increase uncertain.

Historical year-end transaction prices for 42-lb linerboard delivered in the eastern U.S. (before zoned rebates) were as follows: 1991, \$350/short ton; 1990, \$360; 1989, \$390; 1988, \$410; 1987, \$380; 1986, \$320; 1985, \$260.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990	1991e	1992e
Production ¹	18,935	19,185	19,880
Capacity ^{2,3}	19,743	19,989	20,309
Utilization rate	95.9%	96.0%	97.9%
Imports ⁴	114	91	100
Exports	2,520	2,970	3,100
Apparent U.S. consumption	16,529	16,306	16,880
-lb/capita	132.8	129.8	132.8
GNP ratio ⁴	3.98	3.93	3.96

1. Kraft linerboard—excludes recycled. 2. Based on 1991 API capacity survey. 3. Dept. of Commerce. 4. 000 tons/billions \$ real GNP.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container	2,925 ¹	13.8
2. Georgia-Pacific	2,225	10.5
3. International Paper	1,760	8.3
4. Jefferson Smurfit/CCA	1,610	7.6
5. Union Camp	1,600 ²	7.5
6. Temple-Inland	1,525	7.2
7. Weyerhaeuser	1,500	7.0
8. Gaylord Container	1,225 ³	5.8
9. Packaging Corp.	1,160 ⁴	5.5
10. Willamette Industries	900	4.3

Market share of top five companies:

47.8%

Market share of top ten companies:

77.7%

Total U.S. capacity (kraft and recycled) 1992:

21,157

1. Includes all of 85% owned Seminole Kraft Corp. (350,000 tpy) but excludes Canadian operations (216,000 tpy).

2. Includes net capacity from new Savannah, Ga., machine.

3. Reflects shutdown of kraft linerboard machine at Antioch, Calif. mill.

4. Includes Valdosta, Ga., mill (395,000 tpy) acquired from Georgia-Pacific in early 1991.

Planning and scheduling performance

In a previous column, it was suggested that you should rate your area planning and scheduling performance for daily maintenance and shutdown maintenance according to the three following categories:

- planned and scheduled maintenance
- only scheduled, not planned maintenance
- break-in work.

Average results of studies of four tissue mills, five pulp mills, two newsprint mills, and three fine paper mills since April 1991, are shown in the graphs below. It might be interesting to compare your planning and scheduling performance with the results shown. I would be surprised if your situation did not fit a similar pattern.

All mills included in the study are considered average in equipment efficiencies, appearance, and maintenance performance. Data does not vary much between mills. In summary, daily maintenance planning and scheduling performance is the opposite of shutdown maintenance planning and scheduling performance. Break-in jobs are 55% for daily maintenance and 24% for shutdown maintenance. Thirty-two percent of daily maintenance is performed as scheduled, but not planned—for shutdown maintenance, this figure is 36%. Only 13% of daily maintenance is planned and performed according to schedule. Forty percent of

shutdown maintenance is planned and performed according to schedule. This data is based on studies and interviews with operations and maintenance personnel at all levels in the organization and is believed to be as accurate as possible.

When using information only from planners and their managers, the picture is quite different, as they do not always differentiate between planning and scheduling. The planners and their managers might report to upper management that 80% of all maintenance is "planned." Often, no further analysis is done to find out what this figure really means and everyone's satisfied.

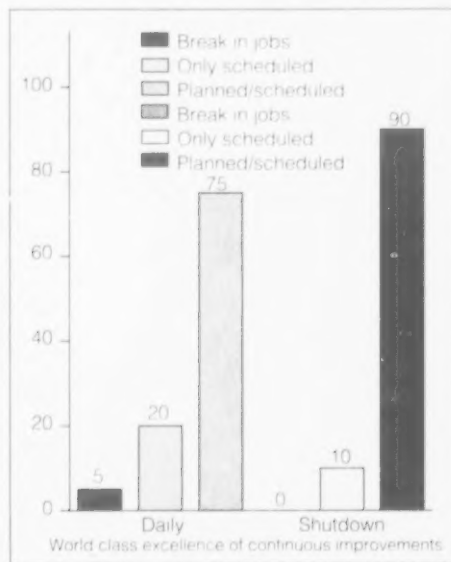
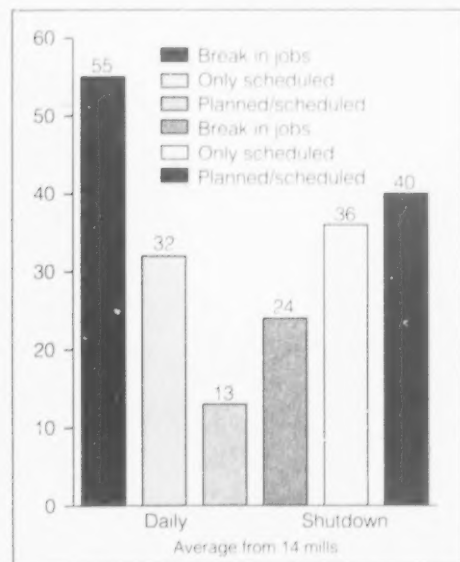
However, you might not see any results in increased production and lowered costs. If you scrutinize your planning and scheduling performance and truly improve it, results will be generated. To generate real results will take more than only planning and scheduling. Because people will get more done in less time, the released resources need to be managed in such a way that real savings are achieved. For example, change your focus toward Design Out Maintenance or Continuous Improvement and, if necessary, attrition over a number of years.

For comparison, I consider World Class Planning and Scheduling Performance to be represented in the following graph.

Note: Examples in this column do not include maintenance of electronic equipment.



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U.S. Paper Industry Will Benefit from Economic Revival This Year

But operating rates and earnings will remain depressed until full recovery is achieved in 1993

The U.S. paper industry is set to benefit from a sustained recovery in the U.S. economy, which should begin this year. However, the recession's effects will carry over into 1992, and industry earnings and operating rates will not truly recover until 1993. Paper company executives and financial analysts surveyed by *Pulp & Paper* say the key to a strong recovery in this very competitive industry is a healthy increase in consumer spending and an improvement in the service sector of the economy.

There is general agreement that the U.S. recession has ended, as inflation and interest rates have dropped, but unemployment in some sectors of the economy remains high. Continued weakness in advertising, finance, real estate, and white-collar employment in general has sharply reduced demand for communications grades of paper. The manufacturing sector of the economy has fared somewhat better, and this, in turn, explains the favorable demand for linerboard and corrugated boxes.

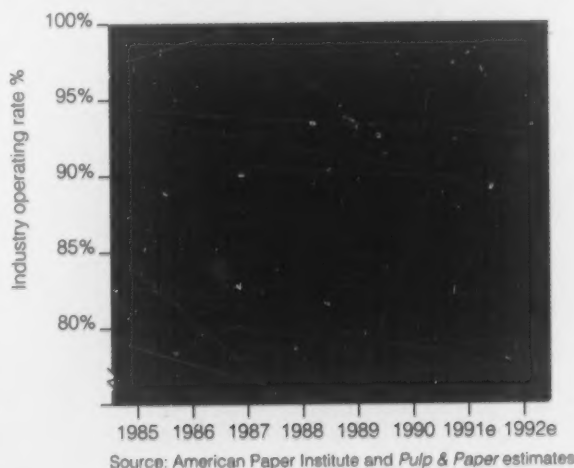
In addition, market pulp prices have shown recent evidence of improvement, but prices remain deeply discounted.

Most analysts believe that the industry will enjoy a recovery similar to past industry cycles, but timing is a critical variable. Lawrence Ross of Paine Webber thinks that the rate of economic recovery will be substantially lower and different from previous cycles because the paper industry had a much larger capacity expansion in 1989-91 than in previous periods. As a result, the decline in prices and operating rates in some sectors of the industry were more severe than expected. This means there will be a longer waiting period until discounting is reversed and prices regain previous peaks.

The 1992 recovery is unlikely to feature sharp industry price gains, according to Evadna Lynn of Dean Witter. "A muted economic recovery combined with a capacity surplus in many grades will result in a sustained period of 89% to 91% operating rates for paper grades—a pattern not seen since the 1960s, when price hikes were sporadic," said Lynn. Historically, upward price movements have not been supported until operating rates reached 93%.

Outlook 1992 was prepared by Pulp & Paper news editors Will Mies, Debra Garcia, Noel DeKing, Robert Galin, Sophie Wilkinson, Mark Weintraub, and Jim McLaren.

Operating rates will remain depressed at U.S. paper and board mills...



... and so will profits!

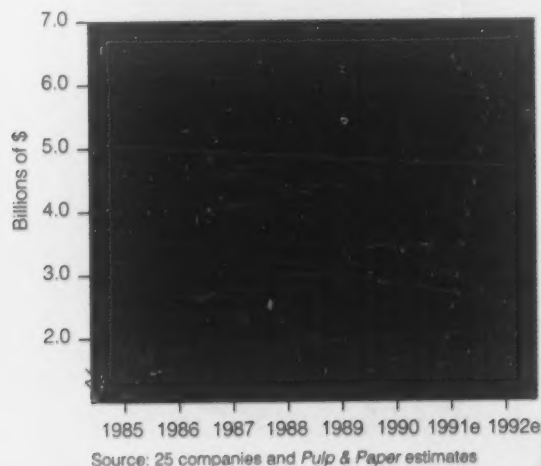


TABLE 1: Analyst's projections for 1992 (percentage change from 1991 levels).

	Growth in real GNP	Production Paper Board	Operating rates ¹ Paper Board	Prices Paper Board	Unit costs ²	Earnings Paper Forest	Housing starts ³
Tom Clephane							
Jeanne Carroll							
Morgan Stanley	3.0%	4.0%	3.3%	90.3%	93.4%	5.5%	8.7%
Evadna Lynn							
Dean Witter Reynolds	2.5	3.6	1.5	90.0	91.9	(1.0)	5.0
Lawrence Ross							
Paine Webber	2.5	5.0	4.0	91.0	94.0	5.0	5.0
William Wigder							
First Boston	2.5	3.7	3.0	90.5	93.2	7.0	3.0
Sherman Chao							
Salomon Brothers	2.2	3.7	2.1	89.5	92.8	(1.0)	8.0
Gary Palmiero							
Oppenheimer & Co.	2.6	3.3	4.1	90.2	93.8	6.5	11.0
Chad Brown							
Merrill Lynch	2.1	3.7	2.2	91.0	93.0	(0.1)	7.0
Mark Diverio							
Shearson Lehman	3.1	3.2	2.9	91.2	93.8	4.2	8.5
Chip Dillon							
First Manhattan	2.0	4.1	1.8	91.7	95.8	2.0	7.0
Average	2.5%	3.8%	2.8%	90.6%	93.5%	3.1%	7.0%

RECOVERY WILL BE GRADUAL. The paper industry has displayed varied signs of improvement in recent months, but virtually all of the analysts who cover the paper and forest products industry have lowered their 1992 earnings estimates. This is based on lower projections for GNP growth in fourth-quarter 1991 and only a 2.5% forecast rise in real GNP in 1992. There is also concern that the U.S. economy may fall briefly into a "double-dip" recession this year. U.S. paper industry volume grows with GNP, and the first year of an industry earnings recovery is typically the slowest of the cycle, followed by larger gains during the second and third years of an economic expansion.

Due to the lower output of the U.S. economy in 1991, domestic consumption of paper and paperboard declined about 2% last year. However, U.S. production remained stable because of rising exports. Exports of paper and board increased more than 15% in 1991, and market pulp exports advanced about 10%, while imports declined slightly. George Adler of Smith Barney, Harris Upham & Co. predicts that U.S. producers are likely to gain additional sales in world markets as long as the dollar stays down, and this should contribute to higher industry output in 1992. U.S. mills have a substantial cost advantage in relation to most foreign competitors, so incremental supplies are likely to come from the U.S. Indeed, exports will continue to grow faster than the domestic market this year.

But higher levels of exports must be matched by higher product prices for earnings to show a strong recovery. Linerboard and market pulp are important exports for U.S. mills, but these grades have seen 15% to

35% declines, respectively, in world prices over the last two years. Profit margins for linerboard and pulp dropped to zero, although the U.S. economy was down only about 0.5% in real GNP. "The U.S. industry is perfectly capable of destroying its own earnings power while being the world's low-cost producer of these products," comments Lawrence Ross of Paine Webber.

EXCESS CAPACITY? The U.S. industry added an estimated 2.5 million tons of additional production capacity for paper and board in 1991, marking the highest annual volume increase in history. Another 2.0 million tons of new capacity is scheduled to be brought online this year. This enormous capacity growth has upset the balance between supply and demand in a number of markets and resulted in significant price declines for market pulp, newsprint, coated papers, and uncoated free-sheet papers. Most of the price and earnings deterioration for these grades has already occurred, with the exception of newsprint. A number of efforts have been made to raise product prices in the past few months, particularly for uncoated papers and market pulp, but any meaningful recovery will depend on boosting demand by a substantial amount this year and again next year.

For 1992, paper production is forecast to increase to 40.3 million tons, a 3.7% increase over 1991. Full-year operating rates for paper grades should reach 90.4% this year, up from 1991's trough level of 89.6%. Uncoated free-sheet papers and coated papers will show the largest volume gains, but both grades will fall short of having a tight balance between supply and demand. As a re-

sult, there are conflicting views about price movements this year.

Chad Brown of Merrill Lynch predicts that coated paper prices will average about 1% lower in 1992, but analyst Jeannne-Carroll of Morgan Stanley believes that coated paper prices will begin turning upward in the second quarter. Uncoated paper prices are already recovering from their cyclical lows.

Paperboard production in 1992 is expected to increase by 3.1% to 41.2 million tons. Since paperboard capacity additions in 1992-93 will be at the lowest level

since 1985, paperboard mill operating rates are forecast to exceed those posted by the paper grades. In fact, semi-chemical paperboard operating rates are forecast to be the highest of any major grade in 1992. An upturn in industrial production and continued export growth should boost demand for linerboard and corrugated boxes. Merrill Lynch's Brown predicts that linerboard prices will average about 9% higher in 1992, and corrugating medium prices will average about 15% higher. Bleached board average prices may decline slightly due to an inventory adjustment in early 1992.

TABLE 2: Industry production (000 tons).

Paper	1988	1989	1990	1991e	1992e
Newsprint	5,982	6,088	6,610	6,740	6,925
Uncoated groundwood	1,624	1,743	1,806	1,780	1,830
Coated paper	7,359	7,215	7,536	7,260	7,750
Uncoated free-sheet	11,277	11,081	11,503	11,405	11,970
Bristols	1,150	1,183	1,152	1,145	1,160
Thin paper	281	262	218	195	190
Cotton paper	169	161	155	150	150
Packaging and industrial	5,033	4,916	4,576	4,465	4,515
Tissue	5,476	5,636	5,802	5,715	5,805
Total paper	38,351	38,265	39,358	38,855	40,295
% change	4.0%	-0.2%	2.9%	-1.3%	3.7%
Paperboard					
Kraft linerboard	17,897	18,056	18,808	18,938	19,532
Other kraft	1,244	1,434	1,549	1,777	1,950
Total	19,140	19,490	20,357	20,715	21,482
Semichemical	5,664	5,691	5,710	5,640	5,810
Bleached board	4,511	4,521	4,399	4,600	4,700
Recycled	8,789	8,817	8,956	8,985	9,200
Total paperboard	36,105	36,519	39,422	39,940	41,192
% change	1.8%	1.1%	2.3%	1.3%	3.1%
Total paper and paperboard	76,456	76,784	78,780	78,795	81,487
% change	2.9%	0.4%	2.6%	0.0%	3.4%

Source: American Paper Institute and Pulp & Paper estimates.

TABLE 3: Industry operating rates (%).

Paper	1988	1989	1990	1991e	1992e
Newsprint	97.8%	96.7%	96.8%	94.0%	94.5%
Uncoated groundwood	95.7	93.0	93.9	92.7	94.9
Coated paper	94.0	92.0	93.8	85.6	87.4
Uncoated free-sheet	94.8	91.6	93.3	88.0	89.0
Bristols	96.2	97.3	95.0	93.0	95.3
Thin paper	85.0	93.2	80.7	76.5	79.1
Cotton paper	83.3	79.7	81.2	79.4	80.2
Packaging and industrial	93.3	90.5	85.8	79.5	80.6
Tissue	96.6	97.2	97.1	93.5	93.1
Total paper	95.4	93.0	93.2	89.6	90.4
Paperboard					
Kraft linerboard	95.7	94.1	95.9	93.9	96.0
Other kraft	79.5	85.1	90.0	92.5	95.0
Total	94.4	93.4	95.4	93.4	95.3
Semichemical	97.8	98.4	97.7	97.0	97.1
Bleached board	95.3	95.8	95.2	94.1	94.6
Recycled	92.2	91.7	89.3	85.9	88.1
Total paperboard	94.5	94.0	94.3	92.3	93.5
Total paper and paperboard	94.9	93.5	93.7	91.1	92.5

Source: American Paper Institute and Pulp & Paper estimates.

MERGERS AND ACQUISITIONS.

Few major companies have the financial resources to undertake major acquisitions in the U.S. paper industry as long as credit is in tight supply, and it is unlikely that non-industry firms will make a hostile bid. "The appetite for initiating hostile bids on the part of corporate managers and financial entrepreneurs is down sharply," says Barry Friedberg, head of investment banking at Merrill Lynch.

The major scene of merger and acquisition activity this year will be in Europe because the transformation to a single market in 1992 creates the need for larger companies to create economies of scale and greater pricing power. U.S. companies that have already expanded in Europe include Stone Container Corp., James River Corp., International Paper Co., and Kimberly-Clark Corp.

As always, however, there will be transactions involving the purchase and sale of individual mills, as well as converting and distribution operations. Some companies are selling assets to improve their operating results, while others are attempting to restructure operations to focus on core businesses. The recent decision by Georgia-Pacific Corp. to sell its Maine newsprint properties to Bowater Inc. is typical of this trend. James River, Boise Cascade Corp., Scott Paper Co., and Weyerhaeuser Co., among other paper companies, have recently divested assets to strengthen financial performance. As industry earnings and net free cash flow increase, the climate for larger transactions will be more favorable.

Long-term outlook

Strong export demand to offset slower domestic growth

■ U.S. demand for paper and paperboard is forecast to increase at a 2.4% annual rate during the 1990s, compared with a 2.9% annual clip in the prior decade, according to FORECASTER SERVICES *Ten-Year Outlook 1991-2000*. As always, expectations for the general economy, including critical variables such as advertising expenditures and industrial production, go a long way in determining prospects for the paper industry. But it is also worth keeping an eye open for the impact of several other factors, such as competition from electronic communications, the costs of environmental compliance, and the shift to recycled-content products. In the meantime, in a reversal of what happened during the 1980s, export tonnage growth is expected to outpace that of imports so that U.S. production should rise 2.6% per annum, basically on par with growth during the 1980s.

PAPER. Helped by growing exports, total paper production is pegged to grow at a 2.6% average annual rate during the 1990s vs 2.8% during the 1980s. But there likely will be significant discrepancy between performance among the various grades.

Newsprint, for one, could well underperform. Of particular concern to producers is that newsprint has been losing share as an advertising vehicle and newspaper readership is declining, suggesting that recent drops in consumption might be more than just a cyclical swing. Also, although having only a small impact on projected newsprint consumption in the *Forecaster's 10-Year Outlook*, electronic information services (EIS) might yet take a bite out of newspaper's customer list. Finally, the legislation-backed trend to recycled-content newsprint is adding extra financial burden on this struggling industry as manufacturers scramble to build recycling facilities.

The outlook for printing/writing papers is brighter. Even demand for these grades, however, is not expected to match the growth rates achieved in the 1980s. The projection for slower growth for printing/writing papers is due to several factors, such as maturation of the business communication boom, in addition to the aforementioned threat from advancing electronic media and the slower growth in advertising expenditures.

Domestic tissue markets are expected to be competitive during the 1990s due to relatively mature end markets, modest domestic population growth (0.7% annually), and rapidly increasing capacity. Growth in shipments of commercial/industrial grades are likely to continue

outpacing consumer grades, 2.5% annually vs 1.3%. Given the relative maturation of the domestic market, U.S. companies will continue to focus energy on expansion abroad, where per capita consumption levels are considerably lower than in North America.

Packaging and industrial papers is one of the few categories likely to experience higher demand growth during the 1990s than it did in the prior decade. The key here is that after having lost substantial market share to plastics during the 1980s, unbleached kraft production looks to be stabilizing as it benefits from consumers' perception that it is more environmentally friendly than plastics.

PAPERBOARD. Forecaster predicts that total paperboard production will register a 2.6% annual growth rate during the 1990s compared with a 2.5% growth rate per annum from 1981 to 1990. Healthy growth in industrial production (forecast at 3.2%/year) plus strong export growth are the key factors underlying this projected performance.

Aided by reasonably priced softwood fiber supplies, the U.S. is the world's leading exporter of paperboard grades, principally kraft linerboard and bleached board. And Forecaster expects the U.S. paperboard producers, helped by a weaker dollar, to leverage their operating advantages and make further gains in the export arena during the 1990s.

That said, there are a few variables that might be working to retard tonnage growth in paperboard. In particular, solid waste problems have focused attention on efforts to reduce packaging for a given product. Also, spurred by a revision to the rail carriers Uniform Freight Classification-Rule 41, the containerboard industry might witness an increasing use of lighter-weight boards, thereby decreasing demand in terms of tonnage.

In the meantime, as announced expansions and conversions by Temple-Inland Inc. and Stone Container Corp. foreshadow, regardless of overall growth, recycled paperboard is going to be taking an increasing chunk of the market. For instance, recycled linerboard is forecast to climb from 2.7% to 8.2% of total domestic demand for total linerboard production, while recycled medium is expected to move from 27% to 38% of total corrugating medium.

TABLE 4: U.S. production (000 tons).

	1980	1990	2000	1981-90	1991-2000
Total paper/board	61,041	78,675	101,530	29%	29%
Total paper	30,117	39,412	50,790	31%	29%
Newsprint	4,673	6,615	7,887	42%	19%
Printing/writing	15,521	22,382	30,962	44%	38%
Tissue	4,439	5,802	6,932	31%	19%
Packaging/other	5,484	4,613	5,009	-16%	9%
Total paperboard	30,924	39,263	50,740	27%	29%
Unbleached kraft	15,295	20,335	25,760	33%	27%
Semichemical medium	4,723	5,829	6,500	23%	12%
Bleached board (SBS)	3,835	4,380	5,370	14%	23%
Recycled paperboard	7,071	8,719	13,110	23%	50%

Source: Forecaster Services 10-Year Outlook 1991-2000.

Uncoated free-sheet

Office papers lead demand growth

■ Uncoated free-sheet mills suffered drastic price cutting in 1991 as a result of the economic recession and massive capacity expansions. However, the combination of a partially recovering economy and inventory building due to three announced price increases caused a surge in demand in the last part of the year. Analysts suggest that demand will remain basically flat this year, advancing from 3.5% to 4% over 1991. Growth will rebound to about 6% in 1993.

Leading the pack is paper used in office reprographics, primarily computer page (laser) printers and copy machines. This sector is expected to grow by 8% or better this year. Operating rates for uncoated free-sheet paper mills in 1991 averaged from 89% to 91%, depending on estimate, and will probably hover around 92% this year. Bruce Kirk of S.G. Warburg Securities suggests that 1992 apparent consumption of uncoated free-sheet paper will be about 12.3 million tons, up almost 7% from last year, compared with a capacity increase of 3.0%.

Jaakko Pöyry Consulting Inc. said consumption of uncoated free-sheet papers is expected to rise about 4% to 5% this year, compared to 1991. Cut-size papers will continue to lead demand and forms bond may improve. Other than additional tonnage from machines already online, no new U.S. or Canadian capacity is due online this year. Champion International Corp. has scheduled startup of a 240,000-tpy uncoated free-sheet machine at Courtland, Ala., for the end of 1993. Also, more capacity from Brazil will be aimed at the U.S. market.

FORMSMAKERS STILL WEAK. An economic turnaround this year could return forms manufacturers to positive sales growth, but the combination of an anemic recovery and forms industry overcapacity will dampen the industry's profitability outlook and encourage further consolidation and restructuring among forms producers. This forecast is according to analysts with the trade group International Business Forms Industries Inc. (IBFI).

Forms converters have had to evolve from an orientation toward manufacturing and the steady expansion of production capacity to one of technology and marketing. Forms manufacturers are including such products as preprinted cutsheet, labels, forms management programs, and promotional printing in their product and service mix. The forms management programs can include nonforms products such as electronic forms design software and integration of Electronic Data Interchange (EDI) standards and systems.

Traditional product lines, such as stock and custom continuous forms, unit sets, and sales books, were particularly hard hit by the economic recession, while cutsheets and pressure-sensitive labels continued to record

positive growth. IBFI reported. Generally speaking, the brightest outlook is for preprinted cutsheets and pressure-sensitive labels.

MODERATE GROWTH AHEAD. Most grades of uncoated free-sheet papers are pegged at similar growth rates. All forecasts are based on the economy turning up and do not include a possible "double-dip" recession, which could occur in the first half of this year. In that light, demand for offset printing papers is expected to rise 3% to 4%, while cover and text grades will advance about 3%, and carbonless paper will grow from 3% to 5%.

Coated paper

Prices stay loose as demand rises

■ Producers of coated printing and publishing papers can expect continued rebound in demand, if the economy continues to recover, analysts say. However, even the uptick in demand will not help prices recover fully until 1993, and a so-called "double-dip recession" in the first half of the year could send markets reeling back down to their lows of 1990-91.

Assuming a continuing economic recovery, demand for coated papers should move above 5% compared with 1991, according to John Maine, vice-president, Resource Information Systems Inc. (RISI). But Maine expects pricing to remain weak. Demand in 1993 could rise 8% to 9% above 1992, he said.

Jaakko Pöyry Consulting Inc. said that coated groundwood paper consumption should post a 5% to 6% increase over 1991, with catalogs and advertising inserts leading the demand increase and a bit of a comeback in magazines. Coated free-sheet consumption may rise 7% to 8%, with a boost from election year politicking. Some of the direct-marketing materials used by candidates include coated free-sheet paper. Also, there will probably continue to be substitution of coated free-sheet paper for coated groundwood, Jaakko Pöyry said.

Jaakko Pöyry estimates that coated groundwood mills will use about 95% of capacity this year, with coated free-sheet mills posting operating rates in the mid-80s.

Coated groundwood grades are still expected to suffer the consequences of a relatively weak magazine market, which accounts for perhaps 50% of coated groundwood paper demand. Coated free-sheet grades are even more vulnerable, with pressure from both the marketplace and continuing capacity increases. By the end of 1990, two new substantial paper machines had come online, one at Champion International Corp.'s mill in Quinnesec, Mich., and the other at Scott Paper Co.'s S.D. Warren Div. in Maine. Consolidated Papers Inc. expects to ramp up its new coated free-sheet machine in Wisconsin this year, adding to the capacity surge.

Growth in demand for Nos. 1, 2, and 3 grades, along

with C1S paper, are expected to average 5% or less. No. 4, including both groundwood and free-sheet grades, will average 3.7% growth, and No. 5 groundwood papers will run about 3.9%. Pricing levels for all grades should rise at least once by the end of next year, though continued economic problems could cause a postponement of any price increases until 1993.

North American producers continue to face stiff competition from European mills, with capacity for coated papers projected to increase 5.2% to a total of almost 6.7 million short tons this year compared with 1991. That is on top of the 13.2% increase in capacity last year. Coated paper capacity will rise another 2.3% in 1993.

Tissue

Producers seek to rebuild margins

■ Producers in both the consumer and commercial and industrial (C&I) tissue sectors were chilled by the 1990-91 recession after many years of slow but steady growth. The away-from-home market suffered to some extent because of its ties to employment and traveling, and the domestic tissue market became more competitive as demand from retailers slowed and new products churned up the market.

Kimberly-Clark Corp.'s re-emergence into the premium consumer bath tissue business in 1990 with its Kleenex product sparked a round of promotional activity among its competitors that is continuing, forcing down product realizations. The industry has since attempted to shake the premium bathroom tissue sector free from excessive promotional activity, with producers implementing price and/or sheet-count reductions in July and August 1991.

Jeanne Carroll, an analyst with Morgan Stanley & Co., said that when tissue manufacturers have reduced the list price in the past they have also generally reduced promotional programs by a similar amount. But, as a result of the economy's shakiness and consumers' stashes of tissue, that move was delayed in 1991. She expected fourth-quarter promotions would be similar to those in the third quarter but believes the tissue sector will recover in first-half 1992.

The other method to rebuild margins is to boost prices, and at least one tissue firm plans to do so. Procter & Gamble Co. spokeswoman Lynn Hailey said that the company would institute a moderate price increase on its premium consumer bathroom tissue brands, Charmin and White Cloud, by reducing trade promotion allowances beginning in January 1992. These two products hold about 30% of the market, according to George Adler, analyst with Smith Barney, Harris Upham & Co.

The price hike attempt may be premature. K-C's new Kleenex premium bath tissue is already on the market in nearly half of the U.S., and plans are afoot to roll it out

nationally. K-C spokeswoman Colleen Berman acknowledged that national marketing of the Kleenex bath tissue would require "another machine or another mill."

Price hikes for C&I tissue were announced at the end of August 1991. Fort Howard Corp. said it would seek a 5% across-the-board increase in commercial tissue, according to Morgan Stanley's Carroll. James River Corp. and Chesapeake Corp. followed suit. Carroll estimates market leader Fort Howard holds 25% of the market, followed by JR with 21% and Scott Paper Co. with 17%.

With the economy improving, Smith Barney's Adler predicts prices and profits will pick up by this spring. And Carroll said that, on the whole, the U.S. tissue market will remain favorable over the next few years due to favorable pricing of raw material and limited new supply.

Containerboard

Ready for the next up-cycle

■ Containerboard should be one of the first segments of the paper industry to improve when the economy begins to strengthen, according to most analysts. With only limited growth expected in linerboard and corrugating medium capacity over the next couple years, any pickup in demand should result in relatively high operating rates in 1992 and a tight market in 1993. "Linerboard should be one of the best-positioned paper products in the coming cycle," says Mark S. Rodgers of Prudential Securities.

The recovery in containerboard is already under way, with a successful \$30/ton price increase last fall, which brought the transaction price for linerboard to around \$350 in the eastern U.S. This reversed an eroding trend that began in the second half of 1989 and carried prices close to the break-even level for some higher-cost mills. Now the main question seems to be, how fast will the recovery proceed?

One of the more optimistic analysts is Thomas P. Clephane of Morgan Stanley & Co., who expects corrugated box shipments to rise by 4.5% in 1992, following a 0.5% increase last year. He projects that linerboard operating rates will average about 95.1% in 1992 and rise to 96.7% in 1993. He expects the price of linerboard to advance to about \$380 by second-quarter 1992 and reach its previous peak of \$410 by the fourth quarter.

Somewhat less positive is Bruce Kirk of S.G. Warburg Securities, who projects corrugated box shipments will grow by only 2.6% this year. He expects linerboard operating rates to average 95.7% in 1992 and 96.4% in 1993. Slower economic growth will make a linerboard price increase difficult in the spring of 1992, and he expects only one successful price increase in the third quarter. Corrugated box buyers would also have difficulty accepting more than one increase at this time, he believes.

The main factor behind the optimism is the re-

strained outlook for containerboard capacity growth. Clephane, for example, expects kraft and recycled linerboard capacity to grow only 1.6% in 1992 and 2.3% in 1993 (based on a May 1991 American Paper Institute capacity survey). The only new linerboard machine planned is Temple-Inland Inc.'s new 215,000-tpy recycled linerboard machine, which is now scheduled to start up at the end of 1992 at Maysville, Ky. No new machines have been announced for corrugating medium, a grade that is already in tight supply—after being “beaten to death” in the last industry downturn, according to one supplier.

One uncertainty is how strong U.S. linerboard exports will be this year, following an estimated 17% to 18% surge in 1991, based on API statistics. Corrugated box demand in Europe has been softening due to slower economic growth in Germany and most other major countries. U.S. linerboard exporters were unsuccessful in pushing through a price increase last fall in Europe. But they may still be able to push through a more recently announced \$40/metric ton increase in the first quarter of this year, due to the recent drop in the value of the dollar. “Even with the increase, U.S. kraft liner will still be cheaper than Scandinavian board (priced in local currencies),” one agent noted.

Any weakening in linerboard exports to Europe would probably be partly offset by higher shipments to the Far East and Latin America. And if the sputtering U.S. economy ever gets into gear, U.S. linerboard mills might even welcome some cooling in exports so they can keep up with domestic demand.

Boxboard

Slow growth expected in 1992

■ Consumer spending is expected to remain weak during the first half of 1992, and this could reduce demand for folding boxboard and other consumer packaging grades. In recent months, inventories at folding carton plants have increased as industry shipments have slowed, and the Paperboard Packaging Council has forecast only a 0.5% increase in folding carton shipments this year. Any upturn in the U.S. economy in the second half of the year could boost retail sales and improve the outlook for solid bleached sulfate (SBS), unbleached kraft, and recycled boxboard grades.

The economy will affect each of these major grades differently. Bleached board prices are currently at peak levels, reflecting a 5% increase to approximately \$870/ton for carton grades that was implemented in mid-1990. Bleached board production also climbed steadily to record levels, following the completion of a large number of machine rebuilds in 1990-91. Capacity jumped 5% to 8% over the last 12 months, and some additional capacity increases are expected in 1992. As a result of this new capacity, and a possible inventory adjustment early in

the year, SBS prices may come under increasing pressure.

SBS production, including milk cartons, cup stock, and exports, is forecast to increase by 2.8% to almost 4.7 million tons this year. Domestic shipments are forecast to increase by 1.7% and exports by 8.7%. Folding cartons and exports will continue to pace SBS growth, while food service packaging will remain weak. Operating rates will be lower early in the year, falling to 91% to 92%, but rates should recover to 95% to 96% in the early phase of the expected industry recovery later in the year.

Production of coated unbleached kraft boxboard increased by more than 20% in 1991, paced by additional output from Mead Corp.'s new board machine. Most of this board is used to manufacture carriers for beer and soda, but inroads have also been made in the traditional folding carton markets. The worldwide market for coated board is growing 10% annually, and is expected to continue at this rate until the mid-1990s. Because of this strong growth trend, Mead and Riverwood International Corp. both raised their prices in 1991.

Recycled grades have been supported by strong demand for folding cartons and shipping containers made from recycled paper, but poor demand for the construction grades has depressed operating rates for this sector. Production of folding carton grades climbed 5% in 1991, but gypsum wallboard dropped nearly 25%, resulting in virtually no change in total output for the year. For 1992, total production of recycled grades is forecast to increase by 3.8% to 9.5 million tons. The highest growth rate will come from the containerboard grades, which are discussed elsewhere in this section.

Recycled boxboard producers did not attempt to raise prices in 1991, despite higher prices for SBS and coated kraft grades. The last price increase for recycled folding carton grades occurred in fourth-quarter 1990. Current prices for clay-coated newsback (CCNB) grades are approximately \$545/ton, with higher prices for kraft back grades and customers on the West Coast. If the output of recycled folding boxboard continues to reach record levels, as it did last October, producers are expected to attempt a price hike in early 1992.

The 1992 forecast remains conservative for SBS but somewhat better for coated kraft and recycled grades. The 1992 forecast assumes a weak economy in the first half of the year, followed by a strong recovery in the second half of the year.

Wastepaper

Recovery will be short-lived

■ Wastepaper projections look better for 1992, but the anticipated recovery is not expected to last long. As early as 1993, conditions could begin to deteriorate again due to flourishing supplies. Wastepaper consumption is expected to improve this year because of expanding re-

cycled paper and paperboard capacity. This will cause some paperstock prices to rise, providing an incentive for increasing collections. As generation mounts, though, the supply/demand equilibrium will be upset and the market will tumble down again sometime in 1993.

This was the consensus of opinion from forecasters and market executives who cover the industry. Some were more pessimistic than others, but all generally draw a gloomy outlook for at least parts of 1992 and beyond. The shake-up in the wastepaper business, which has seen many smaller brokers and dealers acquired by larger firms, including paper companies and waste haulers, is expected to continue—though at a slower pace than in recent years. Into the foreseeable future, the processing and selling of wastepaper is not an attractive business.

The wastepaper business, in fact, appears to be headed for a long recession. Factors that once controlled the marketplace have changed. Waste haulers are steadily taking over collections of the lower grades. More and more municipalities are starting curbside collections, and offices are starting their own sorting programs. It is anticipated that municipal and office collections will continue to grow, providing a seemingly endless potential for wastepaper generation.

Even the numerous new recycled paper and paperboard expansions that started up in 1991 or will come onstream in the coming years will not really absorb the burgeoning flow of recyclable paper being made available by continually increasing collections. In recent years, municipal curbside collections have inundated the marketplace with old newspapers (ONP). Now, these programs are starting to expand into grades such as old corrugated containers (OCC) and mixed papers. Also, office collection programs are proliferating, adding to supplies of high-grade deinking papers and pulp substitutes.

TECHNOLOGY IMPROVEMENTS WOULD HELP. Government intervention in the marketplace—through recycled-content mandates, procurement provisions, and recycling goals—will continue to push public and private sectors into sorting out their recyclables from the solid waste stream and will force industry to strive for ever-improving technology to manufacture products containing recycled materials. Eventually, this may lead to technology which can absorb much of the wastepaper that is collectable.

The major force in the marketplace in 1992 will probably be the continuing evolution of office collection programs, said Fred Iannazzi, president of Andover International Associates. Offices have traditionally tried to sort out only the highest grades from the office waste stream. However, more and more offices now are collecting all grades, and mills are accepting more and more of the lower grades. Companies such as Fort Howard Corp., Union Camp Corp., and James River Corp. have their own specifications for what they will accept from offices.

SOME PRICES MAY IMPROVE. Despite generally improved market conditions in 1992, though, prices are not expected to rise across the board. Specific grades will be affected by their own special factors. Pulp substitutes prices, for instance, normally follow market pulp prices. If woodpulp prices remain depressed in 1992—as some expect they will—pulp substitute prices will not improve. Deinking grades are also linked to some extent to woodpulp prices, as well as to export demand for such grades as the sorted ledgers.

Bulk grade prices for ONP and OCC are tied to the supply/demand balance, which is expected to improve in 1992. The best bet is that OCC prices will rise because municipal collection systems for this grade are still in the formative stages, according to Iannazzi. A paperstock broker agreed, expecting that OCC demand from linerboard mills would pick up significantly sometime in 1992. ONP prices, though, are expected to remain relatively flat. Iannazzi doesn't expect ONP prices to rise through 1995. David Clapp, economist for Resource Information Systems Inc., agreed, noting that any rise in ONP prices would result in increased generation, which would erode prices once again.

DEINKING CAPACITY EXPANDING RAPIDLY. ONP demand, though, will be one of the healthiest signs in the marketplace. Deinking capacity will expand substantially over the next several years, particularly for newsprint production. In 1991, at least 45 deinking facilities were started up in the U.S. and Canada, adding more than 3 million short tons of recycled fiber capacity.

Recycled newsprint capacity was projected to increase by 150% by the end of 1991. Thirty percent of that capacity was to contain at least 40% recycled fiber by the end of 1992. Ten new newsprint deinking facilities started up in 1991, adding just over 1 million tons of recycled fiber capacity, and eight are expected to start up in 1992, adding nearly 900,000 tons. In tissue production, more than half of the 400,000 tons of tissue capacity coming onstream from 1990 to 1993 will use deinked wastepaper.

Overall, the industry continues to forge ahead toward the American Paper Institute's goal of 40% recovery by 1995. U.S. wastepaper recovery reached nearly 29 million short tons in 1990, according to API. Analysts project that between 30 million and 33 million tons will be recovered this year. This is expected to increase to anywhere from 38.5 million tons to 40.7 million tons by 1995.

CONSUMPTION PROJECTIONS LOOK GOOD. Consumption of U.S. wastepaper will rise to between 23.1 million and 25.4 million tons in 1992, and to about 30 million tons in 1995, according to analysts. This is up significantly from the approximately 22 million tons consumed in 1990. Much of the growth will be in ONP and OCC. ONP consumption is expected to rise to just under 5 million tons in 1992 and to between 5.7 million and 6.5

million tons in 1995. OCC consumption is forecast to increase to approximately 12 million tons in 1992 and then to between 14.6 million and just over 15 million tons in 1995.

The prognosis for wastepaper exports varies widely. Clapp believes exports will grow to more than 8 million tons in 1992 and to 10.3 million tons in 1995. Iannazzi, however, forecasts that exports will move up only slightly to 6.8 million tons in 1992 and to just under 7.8 million tons by 1995. ONP exports are forecast to increase to between 1.3 million and 1.7 million tons in 1992 and to between 1.5 million and 2.4 million tons in 1995. OCC exports will move up to between 3 million and 4 million tons in 1992 and to between 3.8 million and 4.1 million tons in 1995.

LEGISLATION MAY EASE A BIT. Legislators may ease up somewhat on their attempts to control the industry in 1992. Most states already have set recycling goals for 1992-93 and 1995, said Clapp. Now they are in a wait-and-see mode. If their goals are not met, amendments to these initial bills could come in a year or two. "Severity of these measures will depend on the severity of the solid waste crisis," said Clapp.

Iannazzi believes that legislators will have to come around to the realization that some of the laws they have adopted are unrealistic. He cited the recent proposal by the Recycling Advisory Council, which lists recycled-content percentages for various grades of paper and paperboard. On the printing and writing grades, for instance, a recycled content of 50% is unattainable, Iannazzi noted, because a high percentage of the content of printing/writing grades is not fiber at all, but fillers and coatings.

Pulpwood

Wood products gyrate but chips hold even

■ The wood products market has been enlivened over the past year by a dramatic swing in prices as buyers prematurely anticipated shortages but underlying demand remained soft. Against that backdrop, woodchips were held in stasis by the counterbalancing forces of weak supply and demand.

Wood products prices trended up after the Fish & Wildlife Service (FWS) proposed in the spring of 1991 that 11.6 million acres of forestland be set aside in the Pacific Northwest as spotted owl habitat. Resource Information Systems noted that these timber lockups, together with other harvesting restrictions, could halt nearly all federal timber sales in the Coast region this year and beyond. An analyst with Smith Barney, Harris Upham & Co. said this perception "led to a wave of scare buying similar to the binge in mid-1989." Low lumber inventories and bad harvesting weather in the South

also made wood products customers anxious to buy.

But with FWS cutting back on the amount of sheltered owl habitat in August to 8.2 million acres and with improving weather in the South and little significant recovery in housing starts, upward pressure on prices eroded. Lumber and plywood prices peaked at the end of second-quarter 1991 and then sank back down.

However, the market is expected to strengthen in coming months as housing starts pick up and timber lockups continue to restrict supply. Prudential Securities analyst Mark Rogers believes that the wood products business is "emerging from a ten-year down cycle and will enjoy its most profitable cycle since the 1970s." At least through early 1992, however, Rogers expects pricing volatility.

While all these forces swirled around timber and lumber, the woodchip market in 1991 was a "nonevent," according to one fiber supply manager in the Pacific Northwest. "The downtime in the solid wood industry (due to the poor economy), which has diminished the supply of chips, has been offset by near equal downtime in the pulp and paper sector," he said. "That left inventories and prices at a constant level." The market for hardwood chips has softened with Japanese purchasing off, he added, and that could lead to a downward trend in pricing. In the fourth quarter, however, prices for chips exported from the West Coast to Japan remained at third-quarter 1991 levels, with Douglas fir going for \$122.00/bdu f.o.b. vessel, red alder for \$120.00, and spruce/pine/fir for \$123.60, according to Wood Fibre Northwest.

Although sawmill curtailments have impinged on the supply of chips, "whole-log chipping has been stepped up to fill the void," said another fiber manager in the Pacific Northwest. And fiber buyers may soon have another option if the Forest Service releases timber in northeastern Oregon that has been killed off by the spruce budworm, he added. As in the U.S., current chip inventories in British Columbia are "relatively comfortable," noted one buyer. Chip prices had dropped some in the fourth quarter, but he expected relatively static pricing on into first-quarter 1992.

In the Southeast, one senior forester said exports had dropped off some, freeing up chips for domestic users. Also helping to ease market tightness was the end of an extended rainy season, followed by about a month and a half of dry weather, when chip buyers restocked after running quite low. He said fourth-quarter chip demand was similar to the third quarter, though he expects it to pick up in the new year as chip customers build inventories in preparation for more wet weather. He predicted prices would hold steady in the fourth quarter compared with the third quarter but would then incline in first-quarter 1992. He added that pine roundwood prices dropped from the third quarter to the fourth quarter, while hardwood rose. Pine stocks were high but hardwood was scarce because it is found in wetter regions that were harder to access in the rainy season. ■

Another Year of Bottom-Line Losses and Capacity Shutdowns Could Be In Store

The good news from Canada is that its general economy emerged from recession in the second quarter of 1991, and, despite subsequent sluggishness, the Canadian government expects economic conditions to be "much better in the near future." Even so, the bad news for export-driven companies in the Canadian forest products industry is that current and prospective earnings are so bleak that many observers are no longer comparing the industry's downturn with the dip in 1981-82, but rather with the depression years of the early 1930s.

1991 WAS A DISASTER. A *Pulp & Paper Week* survey of 18 Canadian forest products companies showed a net loss, excluding nonrecurring items, of C\$705 million for the nine months ended Sept. 30, 1991. Everything was going wrong. Newsprint prices, which many had hoped would improve or at least stabilize in 1991, headed lower throughout the year as advertising increasingly turned to more focused and specialized media, causing newsprint consumption to drop faster than anticipated. And northern bleached softwood pulp prices, after peaking at US\$830/ton in 1989-90, sunk \$500/ton and below by late 1991, as the worldwide buildup in pulp capacity coincided with cyclical weakness in demand. In the meantime, wood products manufacturers, despite a flicker of revival in the spring, struggled through yet another year of low product prices, as the construction industry failed to bounce back despite falling interest

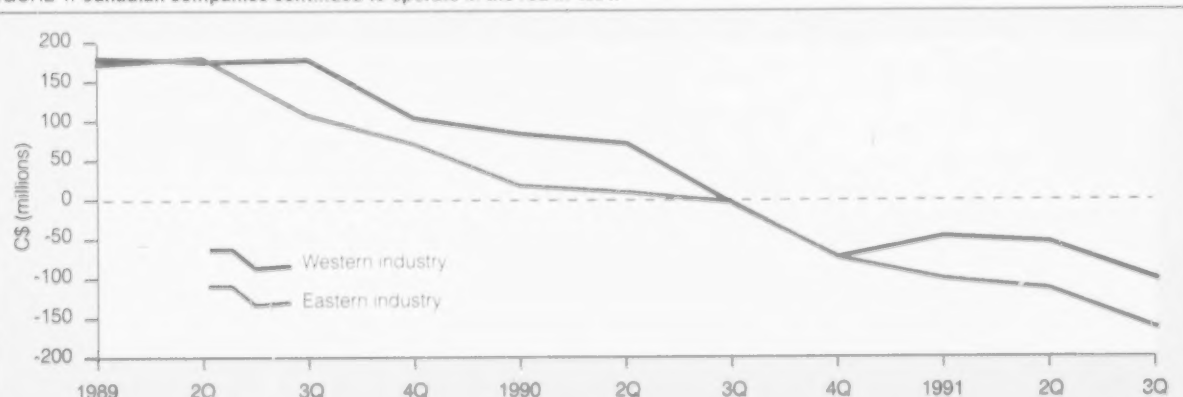
rates. As 1991 progressed, Canada's currency seemed to be the only commodity that was gaining value south of the border. Starting the year at US85.5¢, the Canadian greenback was trading at about 88¢ in early December 1991. This hurts Canadian producers because most of their products are priced in U.S. dollars, while costs are incurred in local currency.

A TURNAROUND IS NOT EXPECTED IN 1992. The supply-demand equation suggests that the forest products industry should brace for another chilling year at the bottom line. On the consumption side, prospects for the North American economy are mixed, with few signs of a strong recovery. And of at least equal concern are apparent structural changes affecting demand for Canada's two key pulp and paper products, newsprint and market pulp. Newsprint manufacturers are being devastated as depressed advertising dollars increasingly shift to other more focused and specialized media. Market pulp producers, meanwhile, stand to lose out as manufacturers place growing emphasis on the use of recycled fibers.

On the supply side, the world is awash in pulp and paper, especially newsprint and market pulp, following excessive capacity expansions in recent years. A good deal of attention is now being focused on where the capacity rationalizations needed to bring supply and demand back into equilibrium will take place.

Due to antiquated machinery and high labor costs, it

FIGURE 1: Canadian companies continued to operate in the red in 1991.



Western industry includes Canfor, Crestbrook, Doman, Fletcher Challenge Canada, MacMillan Bloedel, Scott Paper Ltd., Waidwood, and West Fraser. Eastern industry includes Abitibi-Price, Canadian Pacific Forest Products, Cascades, Domtar, Donohue, Repap, Rolland, and Tembec.

Source: Canadian Paper Analyst.

is expected that the Canadians will bear a disproportionate share of the shutdowns. Already, several mills, including chemi-thermomechanical pulp facilities at Port Cartier and Matane in Quebec as well as an Abitibi-Price Inc. newsprint mill at Thunder Bay, Ont., have been closed for indefinite periods. And other manufacturers, such as E.B. Eddy Forest Products Ltd., have mothballed machines while keeping mills running. Looking ahead, more mill and machine closures are sure to follow as companies are forced to curtail the cash drain. To balance newsprint markets, for instance, Jaak Puusepp of RBC Dominion Securities Pemberton has suggested that, besides Thunder Bay, another seven to eight machines with an aggregate capacity of 330,000 metric tons will have to be shut down in eastern Canada. Capacity reductions, in turn, should eventually lead to improved pricing. But, in a catch-22 of sorts, the Canadian industry will be left with a smaller share of the worldwide market, compromising growth potential, when production and pricing recover.

FUNDING CASH SHORTFALLS. For much of 1991, despite plummeting corporate profits, the share prices of Canadian forest products concerns fared surprisingly well. Whether investors were demonstrating an ability to "look beyond" or an inability to grasp what was going on in front of their eyes is a debatable issue. Regardless, cash-starved companies took advantage of the situation, raising sorely needed capital in a series of equity and rights offerings. (Analysts have also pointed out that a number of industry insiders cashed in during recent strength in the stock market.) Among the tappers of the outside investor, were Noranda Forest Inc., MacMillan Bloedel Ltd., Repap Enterprises Corp. Inc., Domtar Inc., Cascades Inc., West Fraser Timber Co. Ltd., Canfor Corp., and Tembec Inc. Meanwhile, divestments provided cushions for the likes of Abitibi-Price, and Canadian Pacific Forest Products Ltd. And in other cases, such as Temboard & Co. Ltd. Partnership, government agencies and banks have cut deals to help prevent firms from drowning in interest payments.

Given the dismal outlook for corporate earnings in 1992, cash shortfalls from operations will again likely have to be met through external financing, asset sales, or the like. Among possible asset sellers are Domtar, which has suggested it would like to reduce the number of businesses in which it operates; CP Forest, which has indicated that its packaging businesses are for sale; Fletcher Challenge Canada Ltd., which has been toying with the idea of selling a 50% stake in its Crofton pulp mill or divesting other assets; and Noranda Forest, which, following a \$51-million loss in the September period, stressed that it "would sell assets as necessary to ensure that the company was well positioned to benefit when the market recovers." Unfortunately, given the industry's cloudy outlook and an overabundance of assets on the auction block, although there may be plenty of willing sellers, it is going to be difficult to find buyers

willing to pay a "fair" price.

Making difficult conditions even worse, many Canadian paper companies are having to funnel what scarce capital they have into zero-return projects necessary to keep pace with environmentally driven changes occurring in the industry. Newsprint manufacturers such as CP Forest, Kruger Inc., and Daishowa Forest Products Ltd., for instance, are busy building additional recycling capacity to meet recycled-content demand (backed by legislation in some U.S. states). And fast-approaching environmental hurdles have yet to be cleared at many Canadian pulp mills.

LABOR TROUBLES LOOM AS A POSSIBILITY. Strikes were narrowly averted in British Columbia in September 1991, when unions and corporate managements agreed to a ten-month contract extension that included no wage increases or changes to work rules. New labor negotiations could resume as early as March 1992, and, with management pointing at bottom-line deficits and workers pointing to decreasing salaries in inflation-adjusted dollars, the stage is set for confrontation. The bargaining edge this time around might well lie with management since some strike-induced lost production would actually help firm sloppy markets and lead to de facto payroll cuts, at least temporarily. Also, almost everyone accepts that fundamental changes necessary to increase Canada's competitiveness in the global forest products marketplace must include a reduction in labor costs. But the going is expected to be bitter and tough, particularly as the political tide in British Columbia appears to be shifting to an increasingly prolabor stance.

Newsprint

Markets severely out of balance

■ Newsprint manufacturers and customers alike say they do not expect a recovery in the coming year that will undo the combination of falling consumption and high inventories, which has ravaged North American markets for two years running. Fundamental changes are expected to take place within the newsprint and newspaper industries themselves that may alter the way business is done for the next several years. Manufacturers are analyzing the profitability of their operations as they consider the costs of producing recycled products while buyers grapple with recycled use legislation and reshape their newspapers to hang on to readers and advertisers. Problems facing the newsprint industry go beyond the hardship caused by the current economic recession, but observers are quick to point out that the cyclical downturn could run its course by early 1993, when retail advertising picks up again. Still, several mills and thousands of jobs, especially in Canada, are not expected to survive the industry shakeout.

Lower operating rates with almost 1.2 million metric tons of market-related downtime by producers managed to work off most of the roughly 2 million tons of excess capacity in 1991, but inventories at Canadian mills ballooned to 606,000 tons in October, an increase of 40% compared with the same period in 1990, according to the Canadian Pulp & Paper Assn. (CPPA). September statistics showed that publisher stockpiles were beginning to come down and consumption was not falling as rapidly as before, but mill stocks virtually negated any significant improvement in regard to inventories. Negative consumption figures continued to be disheartening, especially because they were being compared with the period in 1990 that signaled the onset of the current economic recession.

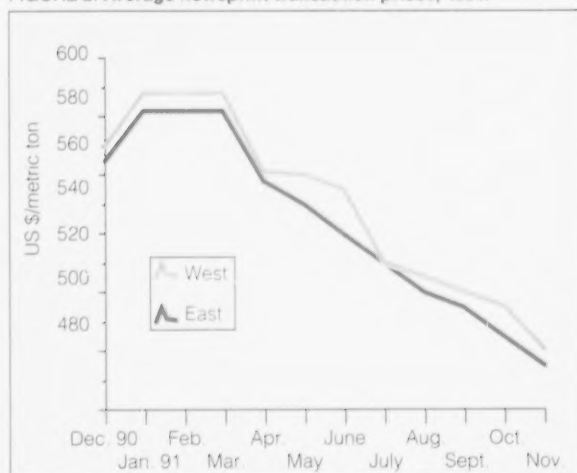
CPPA statistics showed that U.S. consumption dropped 5.8% to 958,000 metric tons in September 1991 and was down 8.0% on a year-to-date comparison to 8.3 million tons. Both aspects indicated some stability in supply and demand since the end of July, but of some concern was a 10% decline in newsprint consumption by U.S. daily newspapers in September, reported by the American Newspaper Publishers Assn. The coming year presents the same problem of too much production and not enough consumption, with excess capacity at about 1.5 million tons, observers conclude.

PRICES ON A LONG SLOPE. With the industry in a full-blown buyers' market, prices dropped about 20% during the course of 1991 as discounts deepened for large and small customers alike. Despite many producers operating at break-even levels, though, companies still did not make the bold moves that appear necessary in order to turn the market around. Abitibi-Price Inc. shut down its Thunder Bay Div. mill in Thunder Bay, Ont., for at least two years, but as of early December no other Canadian producer had taken such a step. Downtime became the rule, although many producers were conspicuously absent from the list of closures. While most observers indicated that the bottom of the price drop should occur by the beginning of 1992, some buyers indicated that, given the lack of dramatic action by the mills, there was no evidence that improvement in the balance of supply and demand was imminent.

Newsprint exports were the saving grace for North American newsprint producers through most of 1991, but Canadians failed to win an emergency increase in the tariff-free quotas to European Community (EC) markets. With such high inventory in North America, Canadian producers were expected to continue to sell in EC countries and absorb the tariff. U.S. newsprint exports, largely to Central and South America, gained 35.6% through September 1991, while new domestic capacity supplanted Canadian imports. Overseas imports to the U.S. slowed to a trickle in 1991, indicating a bloated market unable to absorb any more newsprint.

A gradual decrease of the days-on-hand supply of newsprint at U.S. customers did hold out promise that

FIGURE 2: Average newsprint transaction prices, 1991.



producers were going to see a substantial pickup during the Christmas season. An executive with one major newsprint producer noted, however, that November orders showed no sign of a real improvement in demand. Others also observed a seasonal pickup but nothing to be overly cheerful about. For 1992, many producers and buyers indicated that consumption will be flat at best, but declines would not be as bad as those experienced in 1991.

MORE CAPACITY, ESPECIALLY RECYCLED. Total North American newsprint capacity is expected to rise 4.0% from 16.9 million tons in the 1991-92 period and by 0.9% to 17.7 million tons in 1993, according to statistics by the American Paper Institute (API) and CPPA. After a decline of about 7.7% in 1991, domestic consumption is forecast to rise by 2.5% in both 1992 and 1993, according to one financial analyst, hardly absorbing the new capacity. Balance will be achieved by Canadian operating rates in the low-80 percentile, while U.S. mills will achieve 94% in 1992 and 97% in 1993. Total operating rates will hover below 90% for the next two years.

According to a new report by Davis Recycling Consultants (DRC), 26 North American newsprint mills will be producing 7.8 million tons of recycled newsprint (40% of total capacity) by 1993, up from 15% in 1990. With 16 new deinking plants coming online in the next couple of years, recovery rates as well as prices for old newspapers (ONP) and old magazines (OMG) promise to rise, with collection of ONP needing to increase 45% to keep pace with increasing demand from the new mills.

The growth in demand will undoubtedly stretch supply lines and firm wastepaper prices, perhaps increasing prices to \$60+/ton, the report states, as traditional sources of ONP and pressroom waste outpace curbside collection volumes. Total ONP recovery rates should increase from 37% in 1990 to 52%, or perhaps as high as 59%, in 1993.

Uncoated groundwood

Strong demand for supercalendered

■ Growth in groundwood papers will be lead by supercalendered (SC) grades, principally the premium SC-A grade, and by soft calendered paper. Annual U.S. consumption of SC paper is currently about 1.5 million tons, of which 90% is clay-filled. About 65% of the consumption is produced in North America; the rest is imported from Europe and Scandinavia. In fact, offshore capacity will be increasing by 1 million tons by 1993, bringing worldwide capacity to over 5 million short tons. Growth is projected at a minimum of 3% annually, with a high of 6% annually, according to the Supercalendered Council. Jaakko Pöyry Consulting Inc. projects 1992 SC consumption growth at 5% to 6% and 2% in 1993.

Despite this growth in demand, pricing for SC-A will still follow coated groundwood, which at the end of 1991 was sadly depressed due to weak market conditions. In fact, several North American SC-A producers sold out of paper at least one month in advance but had to keep the differential in pricing with coated groundwood.

Soft calendering, designed to improve smoothness and printability, has become "hot." These smooth papers will grow 8% to 10% annually during the next five to ten years, far more than any other groundwood grade and even higher than the 5% to 6% expected for lightweight coated papers.

Similarly, uncoated groundwood papers are starting to catch up with newsprint and free-sheet papers as far as using recycled fibers, which until now has been relatively rare. In fact, there will be significant opportunity for papermakers to sell quality grades containing post-consumer waste fiber, though the use of recycled paper is still a developing market in this sector.

GOOD SIGNS AHEAD. Consumption of uncoated groundwood papers is expected to rise about 3.5 to 3.7%/year, compared with 4.2%/year for coated groundwood and 0.7 to 1%/year for newsprint, according to H.A. Simons Ltd. Jaakko Pöyry forecasts a 4% increase in consumption this year, bringing it to around 1990 levels. Total uncoated groundwood consumption could rise 4.5% in 1993, the consulting firm said.

A study by the Graphics Arts Marketing Information Service, completed in late 1991, indicated that paper demand by retailers, excluding coupon merchandisers and consumer goods manufacturers, will decrease slowly over the next decade. There also will be an increasing polarization of grades based on positioning of retailers. For example, upscale retailers will continue to use a higher percentage of SC and coated grades. Discounters and "deep" discounters will continue to use newsprint and lower-value groundwood grades.

Total directory paper use is growing about 2.5%/year. Jaakko Pöyry expects directory paper consumption to

advance 3% to 4% this year, compared with no growth in 1991. Groundwood forms is predicted either to remain flat or to decline as various electronic technologies, such as intelligent copiers/printers and laser printers, eat into the overall forms market.

European producers will be trying to sell paper in the U.S. because of increasing overcapacity of publication papers, according to the 1991 capacity survey by the European Paper Institute (EPI).

SC magazine paper will surpass coated grades as the growth leader of the three major sectors, with capacity expected to rise 28.3% from 1991 through 1995, an increase of 887,000 metric tons over the period. SC capacity will reach 4.021 million tons by 1995, EPI reported. However, deliveries are predicted to advance less than 3%/yr, representing just 80% of capacity (3.129 million tons) in 1995, the EPI survey said.

Other grades of uncoated mechanical papers, which represent a small portion of the total publication papers market, will advance 47.2% to hit 976,000 tons in 1995, EPI reported. This is a five-year increase of 313,000 tons. Deliveries will grow at about 1.5%/yr for the period.

Market pulp

Pulp price and demand rebound

■ The past year was difficult for market pulp producers, who had to contend with high raw material costs and poor returns on the finished pulp. They endured months of relentless price declines, with the bellwether northern bleached softwood kraft (NBSK) grade sinking from \$830/ton in the U.S. in second-quarter 1990 to \$500/ton and below by November 1991. However, producers appeared to rally in fourth-quarter 1991. Price increases on NBSK, southern pine, and southern hardwood pulp that were scheduled to go into effect in various world markets between November and January, were announced, ranging from \$20 to \$60/ton. Northern softwood was still in oversupply, but southern softwood and hardwood were in relatively tight supply. With inventories down and the dollar weak, producers felt this might be their only chance to push up pulp prices. Waiting for the market to firm further might not have paid off, as capacity from new mills in Alabama, Chile, and Brazil was expected onstream by mid-1992, which could have hurt efforts to raise prices at that time.

Also helping back up the price increase was the rebound in world market pulp demand in 1991. Rod Young, president of Resource Information Systems, attributed the recovery to the end of inventory liquidation in Europe and Japan, resubstitution of low-cost pulp in Far Eastern furnish, and growth in world paper and board consumption. Young estimated that market pulp demand rose 4.5% in 1991 to 31.6 million metric tons after a total decline of 4.4% in 1989-90. Western Europe dominated

consumption, with demand estimated at 14.7 million tons, followed by 7.3 million tons in the Far East, 5.8 million tons in North America, and 3.9 million tons in other regions. World market pulp consumption will jump 6.5% annually in 1992-93, with growth concentrated in Europe and the Far East.

Unfortunately, expansion in supply has, to some extent, undermined the market firming brought about by growth in demand. From 1990 to 1993, expansions will add six million tons to world capacity. Young estimated the ratio of shipments to capacity averaged only 87% in 1991 (the same as in 1990) and will probably reach 93% by 1993. That compares to an average of 97% from mid-1986 through mid-1989.

The excess capacity and weak markets of the last year or two constricted margins to the point where producers in high cost regions such as Finland were operating at varying cost levels. As a result, some high-cost market pulp mills around the globe will likely have to get out of the business for good, leaving the field to low-cost, world-scale mills in low-cost timber regions, according to Georgia-Pacific Corp.'s president and chief operating officer, A.D. "Pete" Correll. He noted that fiber sources such as Brazilian eucalyptus and *radiata* pine from Chile are expanding rapidly and that the cost-effective southern U.S. industry continues to grow.

U.S. softwood market pulp has experienced an average growth rate of 6.1%/year over the last two decades, said David Steuart, president of St. Anne Pulp Sales Co. Ltd. U.S. shipments reached 3.9 million metric tons in 1990, and Steuart predicts U.S. southern pine capacity will reach 4.1 million tons by 1993.

The impact of *radiata* pine kraft pulp has so far been limited because of the small quantities being produced, said Andre Van Bavel, sales director, Celulosa Arauco y Constitución SA. But its importance is growing, as two new *radiata* pine market pulp mills enter into full production in Chile. The two mills—Arauco II and Celulosa del Pacifico—are adding 700,000 tpy to world capacity.

An expected avalanche of new eucalyptus pulp production is receding. Worldwide, of the 5.1 million tons of bleached eucalyptus kraft pulp originally scheduled to go online from 1991 to 2000, only about 1.8 million tons of new eucalyptus pulp capacity will get to the market, said Boris Tabacof, president of Bahia Sul and of ABCECEL (Brazilian Pulp Exporters Assn.). Nevertheless, eucalyptus is gaining over other hardwoods and also over bleached softwoods. Jaakko Pöyry data shows eucalyptus' share of the world bleached pulp market growing from 9% in 1988 to 13% in the year 2000, and Hawkins Wright predicts a shift from 11% in 1990 to 14% in 1994.

In addition to changes in the timber species being used, pulp production processes are also changing. One significant trend is in the bleaching arena. Bleaching pulp with chlorine generates the suspected carcinogen dioxin as well as other chlorinated organic byproducts. Until recently, the industry treated this simply as an environmental problem, but now, the issue is becoming a mar-

keting problem as well, with at least one company reporting it has actually lost pulp sales in Europe as customers favor nonchlorine-bleached pulps.

Some producers have switched to bleaching with chlorine dioxide, which yields fewer harmful byproducts than chlorine, but some environmentalists want the industry to go further. Greenpeace, for example, is calling for an immediate end to the use of all chlorine-based compounds in the bleaching process, said Mark Floegel, a U.S. pulp/paper campaigner with the group.

Incorporating these pulps in finished paper products will require some adjustments among papermakers and their customers. The bulk of the world's paper production is for the printing and writing paper sector, which has traditionally used conventionally bleached kraft (sulfate) pulp. While the concept of using a more environmentally friendly pulp is appealing, there are a number of drawbacks to incorporating such a product in printing/writing grades.

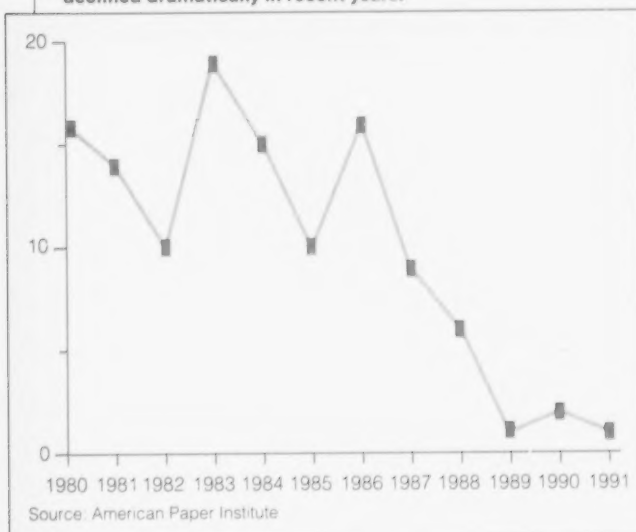
According to Canadian Pulp & Paper Assn. spokesman Pierre Lachance, producers "can't at the moment obtain the qualities desired in terms of strength, purity, and brightness without using some chlorine." Nevertheless, some papermakers and their customers have chosen to content themselves with the properties of chlorine-free kraft pulp, as well as alternatives, including bleached sulfite pulp and bleached chemi-thermomechanical pulp. Kraft pulp treated without elemental chlorine but with chlorine dioxide (and sometimes oxygen delignification) is selling for a premium of about DM30 or \$20/metric ton. These price differentials began showing up in Europe in July 1991. Totally chlorine-free pulp is apparently selling for DM110 or \$65/metric ton above fully bleached northern softwood kraft pulp and has a brightness in the high 70s to low 80s. Munksjö AB, Södra Skogsägarna AB, Empresa Nacional de Celulosas AS, Metsä-Botnia AB, and Howe Sound Pulp & Paper Ltd. are believed to be the only producers of kraft pulps free of any chlorine compounds.

Labor

B.C. talks in spotlight

■ As market pulp and newsprint producers struggle with overcapacity problems, attention will again be riveted on British Columbia labor negotiations as talks resume, possibly as early as March, after a ten-month extension of the expired contract. The negotiations involve 17,000 members of the Canadian Paperworkers Union (CPU) and the Pulp, Paper & Woodworkers of Canada (PPWC) and 19 pulp and paper mills, representing half of Canada's total market pulp capacity and about 19% of total Canadian newsprint capacity. An industry-wide strike was narrowly avoided in September when the contract was extended to April 1992 with no wage in-

FIGURE 3: Strikes in the U.S. pulp and paper industry have declined dramatically in recent years.



crease or changes to work rules.

The contract postponement, which was ratified by a 59% acceptance vote, impacted newsprint markets immediately as customers began to work down inventories built up in anticipation of a major labor disruption. Workers gave management the year without cost increases that it demanded, but observers criticized the industry's failure to direct strategic change in British Columbia's labor structure when it appeared to wield the upper hand. With woodchip, pulp, and newsprint stockpiles at record levels, producers as well as customers expected a disruption, even a drawn-out strike, to provide the much-needed downtime. The British Columbia wage freeze in 1991 translated into the first time since the early 1970s that the base wage rate for eastern

Canadian workers (CS\$17.11/hour) surpassed the rate for western workers (CS\$17.07/hour).

The unions had originally demanded a 12% wage hike in a one-year contract but strengthened their position by meeting the industry's wage freeze demand while avoiding concessions in other areas, such as job descriptions and holidays. With both sides deadlocked over the industry's demand to operate on all statutory holidays and bring down costs across the board, the industry appeared resolved to ride out a strike in order to direct fundamental changes that would go beyond just dealing with the immediate economic recession. Sensing that the irreconcilable positions would lead to a certain strike, labor opted to accept a wage freeze in hopes that the scenario would improve by spring. Although both sides may find themselves with an economic atmosphere equal to or even worse than last year, the unions are bolstered by the recent political success of the prolabor New Democratic Party in British Columbia elections. Still, almost everyone recognizes that fundamental changes are needed to make the province's forest industry more competitive on world markets.

While negotiations dragged on through the summer, two union locals failed to settle local issues and did not formally join the industry-wide negotiations. On Aug. 7, Celgar Pulp Co. locked out 300 members of PPWC Local 1 at the company's mill in Castlegar, B.C., for 18 days in a dispute related to a damage claim against the union. The lockout disrupted an expansion project to double the mill's capacity and removed about 9,900 metric tons of pulp from the market. After the lockout ended, Local 1 joined the protocol negotiations, but PPWC Local 4 and Skeena Cellulose Inc. in Prince Rupert, B.C., remained embroiled over issues related to a job action in 1989 and to contracting out work.

In a move to put themselves in a stronger position for strikes that appear inevitable, CPU members in September voted to more than double their strike pay. Delegates

TABLE 5: British Columbia paper industry labor negotiations 1991-92.

Company/mill	Capacities (metric tpd)			Market pulp	Local union
	Newsprint	Paper	Paperboard		
Canfor Corp., Prince George		295		1,185	CPU/PPWC
Howe Sound Pulp & Paper Ltd., Port Mellon	565			1,000	CPU
Canadian Pacific Forest Products Ltd., Gold River	635			710	PPWC
Cariboo Pulp & Paper Co., Quesnel				950	CPU
Celgar Pulp Co., Castlegar				600	PPWC
Crestbrook Forest Industries Ltd., Cranbrook				580	PPWC
Eurocan Pulp & Paper Co., Kitimat		320	1,000		CPU
Finlay Forest Industries Inc., Mackenzie	600				CPU
Fletcher Challenge Canada Ltd., Campbell River	1,390	87		610	CPU
Crofton	1,400			800	CPU/PPWC
Mackenzie				595	CPU
MacMillan Bloedel Ltd., Nanaimo				1,120	PPWC
Port Alberni	1,000			215	CPU
Powell River	1,900			150	CPU
Northwood Pulp & Timber Ltd., Prince George				1,500	CPU
Skeena Cellulose Inc., Prince Rupert				1,350	PPWC
Western Pulp Limited Partnership Inc., Port Alice				470	CPU
Squamish				700	PPWC
Weyerhaeuser Canada Ltd., Kamloops				1,250	PPWC

CPU=Canadian Paperworkers Union, PPWC=Pulp, Paper & Woodworkers of Canada.

at the union's annual conference in Vancouver, B.C., voted to boost their strike pay from \$80 to \$200/week and to increase their union dues to build CPU's defense fund. The fund totaled close to \$8 million in late 1991, while it would cost CPU about \$1.4 million per week to pay the new level of benefits if a British Columbia strike occurred. The eastern industry will again negotiate for a new contract in 1993 (the old agreement expires Apr. 30) for about 30,000 members of CPU and the Confederation of National Trade Unions. Strikes in eastern Canada in 1990 removed over 700,000 metric tons of newsprint capacity from the market.

U.S. STRIKES DECLINE. The U.S. industry again remained a quiet and stable contrast to Canada in regard to labor, with one strike at a primary paper facility and two at converting plants through the first 11 months of 1991. About 100 members of United Paperworkers International Union (UPIU) Local 3 at Merrimac Paper Co. Inc. in Lawrence, Mass., received a 5% wage hike after a three-week strike ended July 21. The action occurred during Merrimac's annual maintenance shutdown, and the company took over 700 applications for replacement workers shortly before the strike ended.

Over the past few years, U.S. companies have generally been able to eliminate Sunday premium pay and redesign work practices and job descriptions. More recent developments in labor negotiations include the declining use of lump-sum payments in substitution of a first-year wage increase and a dramatic increase in four- and five-year contracts. Through Nov. 1, 1991, about half of the 41 agreements reached were for more than three years, the American Paper Institute reported. But the number of agreements reached was only about half of what it was during the same period in 1990, indicating some drawn-out negotiations. Wage hikes also dipped during 1991, averaging 2.2% through November, compared with 2.5% for all of 1990, API said. Hourly compensation of U.S. paper and allied product production workers increased at an average annual rate of almost 5.5%/year between 1979 and 1989, rising from \$9.64 to \$16.45. Rates of increase averaged 7.6%/year from 1979 to 1985 and 2.4%/year from 1985 to 1989, according to the U.S. Bureau of Labor Statistics. In 1992, 62 contracts will expire in the U.S. pulp, paper, and paperboard industry, involving 26,000 workers.

HEALTH CARE A VITAL ISSUE. Among the most pressing contract issues in current labor negotiations is health insurance. Current estimates provided by AFL-CIO show that as of mid-1991, 11.8% of the entire U.S. gross national product went toward health care, and a study by AFL-CIO showed that 55% of all U.S. strikes in 1990 were over health care issues. Currently, it costs the average American company \$3,000 per employee for health benefits, and by the year 2005, costs will reach \$22,000 per worker. In order to tackle this and other issues, UPIU found an inventive way of establishing coop-

eration with employers through high-level, joint-labor/management committees with James River Corp., Scott Paper Co., and Champion International Corp. One of the fruits of the union's effort was the formation in May 1991 of a "Health Care Reform Partnership" with James River, a paper industry first, to push for fundamental health care reforms. The partnership promised to break new ground in the search to contain skyrocketing health insurance costs, especially as this increasingly becomes a factor in international cost competitiveness.

Industry analysts said that keeping a lid on escalating health insurance costs will be on the main agenda of most paper companies in labor bargaining rounds through the coming years. Health care costs are currently estimated to consume almost 45% of business operating profits, with the health care rate of inflation almost double the consumer price index in 1990.

Environment

Billion-dollar battle against pollution continues

■ Pulp and paper producers have made considerable progress on the environmental front but will face waves of new and updated regulations in the future. Environmental protection already imposes a significant financial burden on the pulp and paper industry, with spending topping \$1 billion annually, according to the National Council of the Paper Industry for Air & Stream Improvement (NCASI). Much of this investment is aimed at water quality protection, with an emphasis on bleach plant modifications to diminish chlorinated organics in effluent.

DIOXINS. Among the most infamous chlorinated organics are the dioxins, a family of 75 compounds demonstrating varying degrees of toxicity. Control of dioxins, particularly 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), has been a major issue for the pulp and paper industry since they were detected in pulp, effluent, and sludge at U.S. bleached kraft pulp mills. Dioxin 2,3,7,8-TCDD is known to be a virulent carcinogen in lab animals—and this has been the basis for some aggressive antidioxin campaigns—but whether humans are equally susceptible has been the focus of contentious debate.

Because of the uncertainty, the Environmental Protection Agency (EPA) is reexamining the risks of dioxin, and this could lead to revisions in regulations. For the time being, EPA has suggested a limit on dioxin in streams of 0.013 parts per quadrillion (ppq). However, individual states are still free to set their own dioxin standards, subject to EPA approval.

EPA and various states are in the midst of issuing wastewater discharge permits—known as National Pollutant Discharge Elimination System (NPDES) permits—to

limit dioxin discharges from pulp and paper mills that utilize chlorine bleaching. Sixty-six of these permits have been issued to mills found to violate water quality standards for dioxin. Within three years of establishing the permits, the mills must meet water-quality-based effluent requirements developed by the states. New permits at other facilities will be issued as their existing permits expire.

EPA is also developing national industrial effluent limit guidelines and standards, based on best-available, economically achievable technologies, to reduce dioxin contamination and total chlorinated organics from the manufacture of bleached paper products. Those standards will be proposed in 1993 and finalized in 1995 and will entail process changes to prevent the formation of dioxin. By 1995, mills will have to comply with whichever of the two types of standards (i.e., water quality or technology based) is more stringent. Reauthorization of the Clean Water Act came under consideration by Congress in 1991, but the legislature will probably not vote on revisions to the Act before October 1992. The Clean Water Act regulates the discharge of pollutants into U.S. water bodies, primarily through permits that apply to industrial discharges and to publicly owned treatment works.

Several states and territories are being warned by EPA to adopt water quality standards for lakes and rivers or else the federal government will impose its own set of regulations. EPA is scheduled to publish standards on the 105 toxic pollutants involved in mid-February. All states had previously been ordered by Congress to regulate these chemicals by February 1990, but not all had complied. The regulations will be used to control effluent emissions via state discharge permits.

AIR. Regulators have also been active in dealing with air pollution. Late in 1990, Congress passed a clean-air bill updating the Clean Air Act. The wide-ranging legislation includes ozone protection measures and smog controls. Acid rain provisions will both cut sulfur dioxide pollution and set limits on nitrogen oxide emissions.

The new law will also require plants to reduce emissions of 189 toxic and cancer-causing substances (including chloroform) by 90% over the next decade. EPA will develop standards over the next several years for controlling these emissions. NCASI indicated that EPA plans to propose standards for the pulp and paper industry in mid-1993. EPA was also scheduled to establish a framework of minimum requirements by the end of 1991 that states can use to set up air pollution provisions for their permitting programs. By the mid-1990s, most major facilities emitting these toxics will begin applying for these permits.

Other pollution prevention measures are afoot. EPA came out with a plan in mid-1991, under which companies that significantly cut toxic air emissions earlier than required by the Clean Air Act amendments could get compliance extensions on further pollution controls.

And EPA administrator William Reilly developed the Industrial Toxics Project. Under this program, companies that emit any of 17 high-priority toxic chemicals (including chloroform) to water, land, or air are being encouraged to voluntarily cut those emissions 50% by 1995 from baseline levels in 1988.

SOLID WASTE. Solid wastes produced by U.S. pulp and paper mills exceed 12 million tpy, with most being dewatered primary and biological sludges that traditionally have been landfilled, though incineration, conversion to useful products, and land application are becoming more popular. In 1991, EPA proposed regulations on land application of sludge generated by pulp and paper mills that use chlorine or chlorine derivatives for bleaching. EPA may also put forward regulations for landfill and surface impoundment of sludge.

In a modification of the Resource Conservation & Recovery Act (RCRA)—which covers hazardous and solid waste management, cleanup of contamination, and conservation of material and energy—the method used to determine whether waste should be treated as hazardous or not was changed in September 1990 and will likely result in more waste being considered hazardous. In addition, the current list of chemicals whose presence above a specified level puts a waste in this category was extended. Chloroform was among the newly included chemicals. In mid-1990, EPA also came up with standards for treating waste prior to land disposal for the remainder of a group of hazardous substances listed under RCRA, as well as five new wastes—including a dioxin waste. The regulations are being phased in from 1990 to 1992. Congress is expected to take on RCRA reauthorization this year.

CANADA. In Canada, the regulatory situation has been confused for years, with individual provinces setting up their own pollution standards and policies. To "even out the playing field" across the country, Canada recently set out to develop national pollution standards for pulp and paper mills.

In April 1990, Environment Canada issued proposed standards that were due to be finalized in mid-1991 and that, if approved, would be fully implemented by 1994. (Plants in unusual circumstances might be able to arrange for an extension.) Among the proposals were Canadian Environmental Protection Act regulations that would require modification of the pulp bleaching process to prevent the formation of dioxins and furans. In addition, an update of the Fisheries Act would modify effluent discharge limits through the use of new measurement procedures and would require all mills to meet standards on suspended solids, oxygen-depleting substances, and acutely lethal effluents. Canada and the U.S. finally overcame their differences over acid rain issues and signed an air pollution agreement early in 1991 to cut emissions of sulfur dioxide and nitrogen oxide over the next several years. ■

Capital Spending Plans: 1991-93

Excess capacity from the recent expansion boom and continued weakness in the economy will force more cutbacks in spending

By CARL ESPE, News Editor

Pulp and paper companies in the U.S. and Canada will cut back sharply on capital spending this year in the face of continued weakness and uncertainty in the economy, stubbornly low prices for major grades, and excess capacity from the expansion boom that peaked last year. The cyclical downturn that first cut into industry profits in 1989 continues today, despite indications that the actual recession that began in 1990 played itself out in early 1991. Capital spending traditionally lags behind a recovery in earnings, so even if the economy picks up later this year, as many analysts expect, 1992 will almost certainly be a down year for investment.

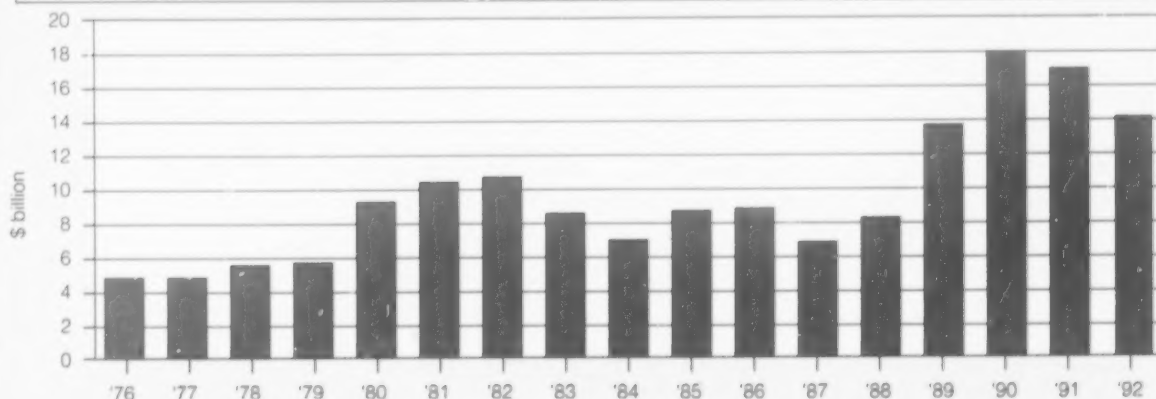
In *Pulp & Paper's* annual year-end survey of spending, U.S. companies reported plans to spend \$14.0 billion on mill improvements over the 1991-93+ period, down 17.7% from plans reported at this time last year for the 1990-92 period. Canadian pulp and paper companies now report plans to spend C\$8.9 billion on mill improvements over the 1991-93 period, down 12.1% from plans reported last year for 1990-92. While smaller than the percentage decline in U.S. spending plans, these new Canadian cutbacks come on the heels of a 21.1% decline last year. The economic downturn has been exacerbated in Canada by companies' dependence on hard-hit market pulp and newsprint and by a strong Canadian dollar that cuts into sales recorded in U.S. dollars.

Projects completed in 1991 account for \$6.1 billion of the U.S. spending total. So far, announcements total \$2.5 billion for projects to be completed in 1992, \$4.0 billion for 1993, and \$1.1 billion for 1994. Projects completed in 1991 account for C\$3.1 billion of the Canadian total. So far, companies have announced plans to spend C\$2.0 billion on projects for startup in 1992, C\$3.3 billion in 1993, and C\$418 million in 1994 and beyond.

The backlog of "proposed" projects—under active consideration, but not yet approved—has declined to \$6.7 billion in the U.S., down almost 28% from last year. The drop-off reflects the cancellation of a number of major expansion plans and difficulty in obtaining financing for projects not backed by major industry players. The backlog that remains still includes several speculative projects that are unlikely to advance during the current slump. Mechanical pulp mill proposals in particular appear unlikely to proceed because of weak markets. Proposed projects in Canada account for a potential C\$5.7 billion in new spending, down 29% from last year's backlog of C\$8.0 billion. As in the U.S., however, this total includes several projects that are unlikely to be approved anytime soon.

While investment plans are definitely being scaled back, it is worth noting that spending will remain very high in historical terms. Outlays planned in the U.S. for 1991-93 are still almost twice as high as they were for 1987-89, just four years ago, and over 30% greater than 1981-83, the peak of the last capital spending cycle. While the year-over-year percentage figures are down,

THREE-YEAR U.S. CAPITAL SPENDING PLAN



Three-year plans as reported by companies for projects completed the previous year and planned for the next two years.

spending remains high in absolute terms. And with the relatively high spending plans reported for 1993 and 1994, companies appear poised to push spending higher when the economic cycle turns up again.

EXPANSION GIVING WAY TO ENVIRONMENT. With the largest expansion boom in history now playing out, environmental improvements have replaced capacity additions as the driving force behind spending plans. Environmental programs account for 13.8% of total spending plans reported by U.S. companies, up from 11.1% last year and 6.9% in 1989. In Canada, environmental projects account for 33.5% of planned outlays, up from 24.9% this time last year, 15.9% at the beginning of 1990, and just 5.5% the year before that. Most of this dramatically increased spending will go toward reducing dioxin formation, installing secondary treatment facilities, and controlling odor at kraft pulp mills.

Capacity expansion will retreat in 1992 from the record pace of 1991. Looking ahead, capacity growth will be strongest in recycled grades, including tissue, newsprint and containerboard. Deinked pulp installations are booming thanks to legislated demand for recycled-content papers, and the major tissue producers are gearing up for a period of above-average capacity expansion. The American Paper Institute reports that over the next three years, U.S. pulp and paper companies will add 2.5 million tons of new pulp capacity and 4.9 million tons of paper and paperboard, an average annual growth rate of 1.9%. This compares to growth rates of 3.0% in 1991 and 2.7% in 1990.

Record capacity expansion is the main reason investment plans shot through the roof in 1990, and why they remained relatively high in 1991. With the end of the boom, however, spending will drop as well. Planned outlays for new paper machines in the U.S. totaled \$3.2

billion in this year's survey, down 30.5% from last year. Spending plans for new mills dropped from \$3.1 billion in last year's survey to \$2.7 billion this year, a decline of 14.5%. In Canada, outlays for new paper machines are expected to total just C\$751 million over the 1991-93 period, down 43.1% from last year. Spending for new mills will fall 3.6% to C\$2.3 billion.

ABOUT P&P'S ANNUAL SURVEY. Now in its twenty-eighth year, P&P's annual capital spending survey covers expansion and modernization programs at U.S. and Canadian mills. Unlike surveys that track spending by year, P&P's survey covers spending by project. Dollar figures represent the total cost of reported projects and often include supporting equipment. The total cost of multi-year projects is assigned to the startup year and is not divided among the years of expenditure. Each survey primarily covers a three-year period—the current survey covers 1991-93, but projects with firm startup dates beyond that time frame are also included. ■

UNITED STATES

Environmental programs and increased use of wastepaper are top priorities

■ After two years of record increases, U.S. pulp and paper companies trimmed their capital spending plans in 1991 in the face of deteriorating profits and sluggish growth. Companies invested heavily during the late 1980s to expand capacity, cut costs, improve product quality, and meet environmental standards, but the spending boom peaked in 1990 as the economy slid into recession.

U.S.—REPORTED CAPITAL EXPENDITURES FOR 1991-93 + BY REGION AND TYPE OF IMPROVEMENT (\$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		REBUILDS		ENERGY		MISC./PLANT	
New England	\$0	0%	\$275,625	5%	\$0	0%	\$53,750	4%	\$40,750	4%	\$44,125	10%
Mid-Atlantic	0	0%	165,400	3%	63,750	2%	46,770	4%	81,375	7%	7,775	2%
East North Central	4,000	1%	376,586	7%	581,030	18%	222,046	17%	346,950	32%	87,554	19%
West North Central	0	0%	11,475	0%	42,075	1%	30,300	2%	32,240	3%	66,610	15%
South Atlantic	62,250	23%	1,683,523	29%	1,131,933	35%	367,120	28%	214,700	20%	111,485	25%
East South Central	89,000	33%	1,680,540	29%	640,550	20%	237,750	18%	137,043	12%	47,817	11%
West South Central	117,950	43%	644,800	11%	344,400	11%	310,500	24%	208,700	19%	68,650	15%
Mountain/Pacific	0	0%	871,353	15%	443,500	14%	31,000	2%	39,100	4%	17,250	4%
Total	273,200		5,709,302		3,247,238		1,299,236		1,100,858		451,266	

ENVIRONMENTAL QUALITY SPENDING

TOTALS

	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
New England	\$45,570	3%	\$10,080	2%	\$9,150	13%	\$414,250	3%	\$64,800	3%	\$479,050	3%
Mid-Atlantic	46,512	3%	22,313	5%	4,500	6%	365,070	3%	73,325	4%	438,395	3%
East North Central	181,675	13%	34,095	7%	10,570	14%	1,618,165	13%	226,340	12%	1,844,505	13%
West North Central	6,480	0%	6,480	1%	3,540	5%	182,700	2%	16,500	1%	199,200	1%
South Atlantic	417,955	30%	104,155	21%	20,240	28%	3,571,010	30%	542,350	28%	4,113,360	29%
East South Central	305,447	22%	141,472	29%	12,981	18%	2,832,700	23%	459,900	24%	3,292,600	23%
West South Central	84,400	6%	127,400	26%	10,250	14%	1,695,000	14%	222,050	11%	1,917,050	14%
Mountain/Pacific	285,600	21%	46,600	9%	1,800	2%	1,402,203	12%	334,000	17%	1,736,203	12%
Total	1,373,839		492,595		73,031		12,081,098		1,939,265		14,020,363	

The recession continues to take its toll on capital spending plans, despite signs that the economy may already have started to rebound. Earnings and capacity utilization remain down sharply in the paper industry, forcing the decline in capital spending.

U.S. pulp and paper companies devoted an increasing portion of their funds to capital improvements during the 1980s, both to increase capacity and to reduce costs and improve their products in order to remain competitive. In absolute terms, spending climbed from \$5.24 billion in 1979 to \$15.69 billion in 1989, an increase of 200%. Capital spending rose from 86% of cash flow in 1978 and 93% in 1979 to well above 100% of cash flow throughout most of the 1980s. To help pay for this increase, companies boosted their long-term debt significantly from \$10.08 billion in 1978 to \$33.19 billion in 1989.

Solid evidence for the current slowdown began to appear early in 1990 as companies lowered their capital plans. In late 1989, the industry reported plans to spend \$17.92 billion on capital projects in 1990, according to the Bureau of Census. In April 1990, however, that figure had fallen by about \$200 million, or 1.1%, from the earlier forecast. A downward revision of 5.1% in planned outlays for the second quarter was responsible for the decline. Further downward revisions followed as the industry responded to slower growth in demand, excess capacity in some grade segments, and reduced profitability.

Despite the slowdown, capital spending still managed to set a new record in 1990 of \$16.53 billion, and paper producers were responsible for the largest percentage increase in capital spending among major U.S. manufacturing industries. In percentage terms, however, the 7.3% increase for paper industry spending in 1990 was down sharply from the 42.7% increase seen in 1989.

Pulp and paper producers revised their spending plans downward throughout 1991. In September 1991, the Census Bureau found that the U.S. paper industry planned to cut back new plant and equipment spending to \$11.93 billion, down 5.3% from plans reported in June. Spending during the first quarter was revised upward by 1.0%, but second-quarter spending came in 9.9% lower than previously expected, and the forecast for the second half was down 3.5% for third-quarter outlays and 8.8% for the final quarter.

On an annualized basis, spending was forecast at a rate of \$11.68 billion in the third quarter and \$11.47 billion in the fourth quarter. Since the final quarter is usually the strongest period, the 1.8% decline expected in 1991's final quarter underlines the weakness of current spending plans.

If spending does come in at \$11.93 billion for 1991, it would represent a drop of 27.8% from the 1990 total of \$16.53 billion, the largest percentage drop by far of any industry group. Overall, U.S. industries planned a 0.5% increase in capital outlays in 1991, with the manufacturing sector down 3.3%.

SPENDING PLANS: 1992 AND BEYOND. *Fulp & Paper's* late 1991 survey of spending plans for the 1991-93 period confirms the slowdown in spending that began in 1990. U.S. companies report plans to spend \$14.0 billion on projects for completion during the 1991-93 period, down 17.7% from plans reported last year for 1990-92. Production-related expenditures total \$12.1 billion for 1991-93, down 20.2% from last year's survey.

The capacity expansion boom that drove spending plans to record levels in the late 1980s played itself out in 1991, leaving environmental improvements as the main engine of capital spending. Environmental outlays planned for the 1991-93 period total \$1.9 billion, up 2.7% from last year. Environmental projects account for 13.8% of total spending plans, up from 11.1% in 1991 and 6.9% in 1990. Mills will be scrambling to comply with stricter regulations covering dioxin formation, odor control, and recycled-fiber content.

Virtually all of the major capacity additions in newsprint and uncoated free-sheet have been completed, and capacity growth will be strongest for the next couple of years in the recycled grades, including tissue, newsprint

NEW U.S. MILL PROJECTS (short tons)

STARTED UP IN 1991

Alabama Pine Pulp, Perdue Hill, Ala.
1,250-metric-tpy market bleached softwood kraft pulp
Kimberly-Clark, Loudon, Tenn.
Commercial and industrial tissue mill

APPROVED OR UNDER CONSTRUCTION

Fox River Fiber , De Pere, Wis.	1992
200-tpd market deinked pulp plant	
Lin-Pac , Gaffney, S.C.	1992
250-tpd "mini-mill" to produce recycled containerboard	
Mi Ho , St. Joseph, Mo.	1992
Recycled coated and uncoated fine paper mill	
Shelby Tissue , Memphis, Tenn.	1992
100-tpd bathroom tissue mill	
American Power Recyclers , Barrackville, W.Va.	1993
400-tpd market deinked pulp mill	
Caithness King , Pejepscot, Maine	1993
550-tpd deinked market pulp mill	
Inland Container , Maysville, Ky.	1993
600-tpd recycled containerboard; Tampella machine	
Ponderosa Fibres , Albany, N.Y.	1993
New mill with capacity for 300 tpd of recycled newsprint	
Ponderosa Fibres , New York, N.Y.	1994
New 300-tpd recycled newsprint mill, expandable to 600 tpd	
Scott Paper , Owensboro, Ky.	1993
Directors have approved initial steps for new tissue mill and converting operation	

PROPOSED (NO STARTUP DATE)

Dunkirk Containerboard, Dunkirk, N.Y.
250,000-tpy recycled containerboard mill
Formosa Chemicals, Wallace, La.
Proposed 1,000-metric-tpd dissolving pulp mill and rayon plant
MacMillan Bloedel, Turlock or West Sacramento, Calif.
Studying feasibility for a 284,000-metric-tpy recycled news mill
Northampton Paperboard, Northampton, Pa.
300,000-tpy recycled paperboard
Jefferson Smurfit, Unspecified, N.Y.
250,000-metric-tpy recycled newsprint mill

and containerboard. Deinked pulp installations are booming thanks to legislated demand for recycled-content papers, and the major tissue producers are gearing up for a period of above-average capacity expansion.

One effect of the recession has been to push back spending into future years. While only a few major projects have been canceled outright, over twenty have been postponed, including new paper machine installations planned by Boise Cascade Corp., Westvaco Corp., Feder-

al Paper Board Co., and Weyerhaeuser Paper Co. Spending plans for 1991 were largely locked in when the downturn started, since most projects were either completed in the first half or under way for completion in the second half, but projects planned for the future have been pushed back from 1992 into 1993 and beyond. Projects completed in 1991 account for \$6.1 billion of the U.S. spending total. Announcements through late 1991 totaled \$2.5 billion for 1992 startups, \$4.0 billion for 1993, and \$1.4 billion for 1994-95.

Among U.S. companies with the largest capital programs are International Paper Co., Champion International Corp., and Weyerhaeuser. While specific spending amounts are not available, Procter & Gamble Co. has announced plans for a major expansion of its toilet tissue and paper towel business. Temple-Inland Inc. is another company that is gearing up for a major round of mill improvements, focusing on recycled containerboard grades.

Since purchasing Great Northern Nekoosa Corp. in 1990, Georgia-Pacific Corp. has been working to reduce debt incurred in the acquisition as rapidly as possible. Analysts report that G-P management is determined to keep capital spending as low as possible during this period, somewhere in the \$400- to \$500-million range required to cover annual maintenance costs. G-P's most recent move was to sell an 80% interest in its Northern Paper Div. operations in Millinocket, Maine, to Bowater Inc. for \$300 million. Bowater will proceed with installation of a deinking plant begun by G-P and is considering future plans for the Millinocket complex that could include a new lightweight coated paper machine.

James River Corp. announced a major reorganization in August 1990 that will lead to sweeping changes in the company's structure. One consequence of the restructuring will be an increase in capital spending to expand the company's core businesses. James River has been forced by the weak economy to stretch out many of these changes, however, including new paper machines slated for the Old Town, Maine, and Naheola, Ala., mills.

SPENDING BY AREA. Projects to combat water pollution remain the industry's highest environmental priority, particularly to limit dioxin formation at bleached kraft pulp mills. Spending plans for water quality improvements total \$1.4 billion for the 1991-93 period, or 71% of overall environmental investment, while spending plans total \$493 million for air quality improvements and \$73 million for solid waste management. These figures are quite conservative since a significant portion of pulp mill spending is, in fact, driven by environmental considerations.

Pulp mill expansion and modernization projects captured the largest share of spending in this year's survey, despite a drop of 7.4% from last year's survey. Mills reported plans to spend \$5.7 billion on pulping projects during the 1991-93 period, or 47% of overall spending. Pulp mill spending accounted for 41% of total outlays in

NEW PAPER MACHINES IN THE U.S. AT EXISTING MILL SITES (short tons)

STARTED UP IN 1991

Fort Howard, Rincon, Ga.
250-tpd, 270-in. Beloit machine—recycled tissue
Georgia-Pacific, Ashdown, Ark.
325,000-tpy, 4,000-fpm Beloit—uncoated free-sheet
North Pacific Paper, Longview, Wash.
230,000-metric-tpy Beloit Bel Baie III—newsprint
Union Camp, Savannah, Ga.
460,000-tpy, 363-in. Vaimet kraft linerboard machine
Union Camp, Eastover, S.C.
240,000-tpy, 372-in. Beloit machine—uncoated free-sheet

APPROVED OR UNDER CONSTRUCTION

Consolidated Papers , Wisconsin Rapids, Wis. 212,000-tpy, 285-in. fourdrinier—coated free-sheet	1992
Kimberly-Clark , Loudon, Tenn. Quality recycled bath tissue machine	1992
Potlatch , Lewiston, Idaho 204-in.-trim, 8,500-fpm Vaimet Performer—tissue	1992
Champion , Courtland, Ala. 240,000-tpy Beloit Bel Baie III machine—uncoated free-sheet	1993
Fort Howard , Green Bay, Wis. Beloit 271-in. machine—tissue	1993
Procter & Gamble , eastern U.S. Two new machines at mills east of the Rockies—tissue	1993
Westvaco , Covington, Va. 350,000-tpy Voith machine—bleached paperboard	1993
Appleton Papers , Combined Locks, Wis. New No. 7 machine, replacing older unit—carbonless paper	1994
Hammermill , Selma, Ala. 300,000-tpy uncoated free-sheet	1994

PROPOSED (NO STARTUP DATE)

Bowater, East Millinocket, Maine
Proposed LWC expansion may include new paper machine
Federal Paper Board, Augusta, Ga.
To produce 650 tpd of either bristols or uncoated free-sheet
Fort Howard, Muskogee, Okla.
Potential sites for new recycled tissue machine
Gulf States Paper, Demopolis, Ala.
Bleached paperboard machine; mid-1990s target
James River, Pennington, Ala.
New tissue machine, delayed from 1993 target
James River, Old Town, Maine
New tissue machine, delayed from 1993 target
Orchids Paper Products, La Palma, Calif.
Considering addition of another new tissue machine
Procter & Gamble, western U.S.
Considering new machine for West Coast location—tissue
Riverwood International, West Monroe, La.
Considering 800-1,000-tpd SUS coated board machine
Smurfit Newsprint of California, Pomona, Calif.
230,000-metric-tpy machine—recycled newsprint
Weyerhaeuser Paper, Springfield, Ore.
1,000-tpd linerboard machine, replacing older unit

the 1990 survey and 38% the year before.

Capacity expansion, environmental upgrading, and cost reduction are the three most important factors in current pulp mill spending plans. Mills have been expanding both market pulp capacity and captive pulp capacity to support more paper and paperboard production. Environmental improvements center on odor control and on reducing chlorine use to limit dioxin formation.

High prices and tight markets made market pulp capacity expansion the driving force behind pulp mill spending in the late 1980s, leading to a number of expansion projects that came online in 1991 and 1992. Several of these mills did not previously produce market pulp.

In late 1991, Parsons & Whitemore Inc. completed construction of a new \$700-million bleached softwood kraft market pulp mill at Claiborne, Ala. The Alabama Pine Co. mill will have capacity for 1,250 metric tpd. Stone Container Corp.'s Port Wentworth, Ga., mill started up a new 740-tpd bleached hardwood kraft market pulp mill as part of a \$335-million modernization, and Union Camp Corp. completed a 105,000-tpy market pulp facility in its \$675-million expansion program at Eastover, S.C. Potlatch Corp. plans a new oxygen delignification system and single pulp line, adding 45,000 tpy to bleached kraft pulp capacity at Lewiston, Idaho, at a cost of \$105 million.

A \$408-million modernization at Champion International's Courtland, Ala., mill included 250,000 tpy of new bleached kraft pulp capacity, setting the stage for the reinstatement of plans to install a new 240,000-tpy uncoated free-sheet paper machine for startup in 1993.

Faced with a solid waste problem that threatens to grow to crisis proportions, more than a dozen states are considering, or have already passed laws mandating, increased use of recycled fiber in newsprint and other paper grades. This situation has led to a boom in secondary-fiber expansion projects and proposals, as paper producers scramble to position themselves for what promises to be a very different market. At least 14 newsprint producers in the U.S. are planning to add deinking

facilities over the next three years.

While virgin newsprint is suffering the effects of overcapacity, there could be a shortage of recycled newsprint over the next few years. Virtually all North American newsprint producers not using any secondary fiber currently are seriously considering some type of expansion into recycled newsprint—including those that are far away from wastepaper sources, such as Bowater's East Millinocket, Maine, mill. Alabama River Newsprint Co., which came online in summer 1990, is installing a 360-metric-tpd deinking plant at a cost of \$55.6 million to allow production of 40% recycled-content newsprint. Smurfit Newsprint Corp. has approved plans to build a new 255,000-metric-tpy recycled newsprint mill in New York, but the company has not yet announced the location. Inland Container Corp. is building a new \$176-million recycled containerboard mill for startup in Maysville, Ky., in 1993, and new recycled paperboard mills have been proposed for the Northeast by Dunkirk Containerboard in New York and Northampton Paperboard in Pennsylvania. On the West Coast, North Pacific Paper Corp. installed a new newsprint machine at Longview, Wash., that includes a deinking facility capable of supplying 25% of overall mill needs.

Spending for paper machine modifications and improvements is down 47% from last year's survey, another victim of slower capacity growth and the economic downturn. Announced spending plans for scheduled rebuild projects total \$1.3 billion for the 1991-93 period, or 11% of overall production-related expenditures.

U.S. mills report plans to spend \$1.1 billion on power plant improvements during the 1991-93 period, about 10% of total production expenditures and an increase of 4.5% over last year's plans. Cogeneration plants have become the major focus of energy spending. In many cases, these plants are being built, owned, and operated by outside contractors; the mill simply supplies fuel for the plant and takes the power generated. Because of such arrangements, interest in this type of project remains strong, despite lower energy prices.

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1991-93 + BY REGION AND TYPE OF IMPROVEMENT (C\$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		REBUILDS		ENERGY		MISC./PLANT	
Maritimes	\$23,405	9%	\$22,124	1%	\$0	0%	\$75	0%	\$150	0%	\$15,710	5%
Quebec	3,930	2%	744,593	22%	287,282	38%	330,169	53%	37,555	7%	96,703	28%
Ontario	4,870	2%	752,088	22%	245,000	33%	187,695	30%	42,030	8%	4,029	1%
Central	26,400	10%	203,280	6%	0	0%	2,000	0%	26,400	5%	9,920	3%
West	202,070	78%	1,680,443	49%	218,755	29%	99,202	16%	445,686	81%	219,322	63%
Total	260,675		3,402,528		751,037		619,141		581,821		345,684	

ENVIRONMENTAL QUALITY SPENDING

	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
Maritimes	\$39,084	2%	\$42,362	6%	\$1,967	1%	\$61,464	1%	\$83,412	3%	\$144,876	2%
Quebec	324,362	15%	36,935	6%	24,239	14%	1,500,232	25%	385,537	13%	1,885,768	21%
Ontario	119,276	6%	23,176	4%	5,424	3%	1,235,712	21%	147,876	5%	1,383,588	16%
Central	39,600	2%	23,100	4%	3,500	2%	268,000	5%	66,200	2%	334,200	4%
West	1,673,553	76%	526,368	81%	142,950	80%	2,865,478	48%	2,306,871	77%	5,172,349	56%
Total	2,189,875		651,940		178,080		5,930,886		2,989,896		8,920,781	

NEW MILLS AND MACHINES. New paper machines account for 27% of announced spending plans for the 1991-93 period. Planned outlays of \$3.2 billion are down 30.5% from last year. New paper machine announcements climbed dramatically in the late 1980s, and now 14 new machines at existing mills and another 8 machines at new mills are scheduled for startup during the 1991-94 period. The most active grades for new machines are tissue, coated and uncoated free-sheet papers, recycled and kraft paperboard, and newsprint.

Union Camp's \$375-million modernization and expansion at Savannah, Ga., replaced two older units with a new kraft linerboard machine in 1991. Union Camp completed a \$700-million expansion in 1991 that includes a new paper machine at its Eastover, S.C., mill. Also in 1991, Georgia-Pacific completed a \$500-million expansion at Ashdown, Ark., adding 325,000 tpy of uncoated free-sheet paper capacity.

Early this year, Consolidated Papers Inc. will complete installation of a new \$400-million coated free-sheet machine at the Wisconsin Rapids Div. Boise Cascade announced plans for a new \$450-million coated groundwood expansion at Rumford, Maine, targeted for completion in late 1993, but the project has been deferred due to poor market conditions.

Kimberly-Clark Corp. started up a new mill in 1991, at Loudon, Tenn., and is already expanding the facility with another machine scheduled for startup in 1992. Fort Howard Corp. installed a fourth recycled tissue machine in 1991 at Rincon, Ga., and the company has announced plans for new capacity at Muskogee, Okla., and Green Bay, Wis. Procter & Gamble Co. plans to install two new tissue machines at mills east of the Rockies by 1993. The company is also studying expansion opportunities on the West Coast that could include another machine or even a new mill.

The latest new machine announcement is by Appleton Papers Inc., which plans to install a new \$170-mil-

lion carbonless and thermal basestock paper machine at Combined Locks, Wis., for startup in 1994. Also targeted for 1994, International Paper's Hammermill Papers unit has reported plans for adding new capacity at Selma, Ala.

Ponderosa Fibres of America Inc. has moved aggressively into recycled newsprint with plans for two mills in New York State, one in New York City and one in Albany. Deinked market pulp mills are planned by several smaller companies, including Caithness King, Fox River Fiber, and American Power Recyclers. Only Fox River Fiber's 200-tpd plant in De Pere, Wis., is under construction at this time, however, with startup scheduled for this year. ■

CANADA

Faced with depression-like economic conditions, mills have cut back severely on investment plans

■ The 1990-91 recession hit Canadian pulp and paper companies hard, leading to a sharp drop in capital spending plans for 1991 and prospects for further cuts in 1992. Spending is down for the third straight year, as the industry retrenches in response to lower earnings and severe overcapacity.

In P&P's new spending survey, companies reported plans to spend C\$8.9 billion (all dollars are Canadian) on mill projects during the 1991-93 period, down 12.1% from plans reported in January 1990 for the 1990-92 period. These results echo a survey by Statistics Canada that forecast a decline of 12.2% in 1991 outlays, to \$3.81 billion. The decline forecast for Canada is smaller than in the U.S., but it comes on top of a 14.8% drop in 1990, when U.S. spending was still rising.

As in the U.S., the capacity expansion boom that drove spending plans to record levels in the late 1980s played itself out in 1991, leaving environmental improvements as the main engine of capital spending. In Canada, outlays for environmental upgrades comprise 34% of planned improvement projects, up from 25% in the January 1991 survey, 16% in 1990, and just 8% in January 1989. New national standards slated for implementation by 1994 will require pulp mill and bleach plant modifications to suppress dioxin and furan formation. Mills are also faced with stricter standards on suspended solids, biological oxygen demand (BOD), and other effluent limits.

The Canadian Pulp & Paper Assn. estimates that the industry must spend approximately \$3 billion a year to maintain and upgrade facilities to improve productivity and competitiveness. With markets still very weak, mills will cut back on expansion projects and concentrate their efforts in the environmental arena.

Plans for further pulp capacity increases in Canada have made a bit of a comeback in the face of stiff envi-

NEW PAPER MACHINES IN CANADA FOR INSTALLATION AT EXISTING MILL SITES (metric tons)

STARTED UP IN 1991

Atlantic Packaging, Whitby, Ont.

150,000-tpy Voith recycled newsprint machine

Canadian Pacific, Thunder Bay, Ont.

240,000-tpy, 362-in. Valmet machine, replacing two—newsprint

Kruger, Trois Rivières, Que.

180,000-tpy, 300-in.-trim Beloit machine—newsprint

Perkins Papers, Candiac, Que.

48,500-short-tpy Valmet machine—recycled tissue

Stone-Consolidated, Grand'Mère, Que.

183,000-tpy machine, replacing two older units—groundwood specialties

PROPOSED (NO STARTUP DATE)

MacMillan Bloedel, Powell River, B.C.

Mill upgrade may include new machine for higher-value grades

Tembec, Temiscaming, Que.

200,000-tpy coated fine paper machine

Vicell Canada Tissue, Delta, B.C.

9,000-tpy dry-form tissue machine

ronmental opposition. Alberta-Pacific Forest Industries \$1.3-billion kraft pulp mill proposal got the green light in early 1991 after a series of delays that almost killed the project, and Celgar Pulp Co.'s \$700-million face-lift at Castlegar, B.C., passed environmental review by a newly formed provincial panel.

Projects completed in 1991 account for \$3.1 billion of reported Canadian outlays in the P&P survey. Through late 1991, companies had announced plans to spend \$2.03 billion on projects for startup in 1992, \$3.3 billion in 1993, and \$418 million in 1994-95. Proposed projects have been cut back, dropping 27% since last year to \$5.6 billion. However, many of these proposals are for greenfield projects which will be hard to finance given current market conditions.

As in the U.S., companies are scrambling to install deinking capacity to meet demand for recycled papers. Abitibi-Price Inc., Boise Cascade Canada Ltd., Bowater Mersey Paper Co., and Stone-Consolidated Inc. have all stated publicly that they are studying plans to incorporate secondary fiber in their newsprint operations. Donohue Inc. and James MacLaren Industries Inc. have proposed a joint-venture facility for Montreal. Cascades Inc., Noranda Forest Recycled Papers and Kruger Inc. are also considering deinking expansions, and Orford Recycling Inc. has proposed a 120,000-metric-tpy (all tons are metric) market deinked pulp mill for Drummondville, Que. Daishowa Forest Products Ltd. announced that it will install a large deinking plant for recycled newsprint and directory paper production at its Quebec City, Que., mill. In western Canada, Fletcher Challenge Canada Ltd. and MacMillan Bloedel Ltd. have agreed to take the output of a new market deinked pulp plant to be built by Newtech Recycling Inc. in Coquitlam, B.C. There are currently no deinking facilities in western Canada.

GEOGRAPHIC BREAKDOWN. During the past decade, the pattern of provincial expenditures has shifted in focus from western Canada to eastern Canada, and then back again. Until 1982, British Columbia and Alberta led the field in total dollar amounts, capacity expansion, and greenfield mill plans. After 1982, spending programs in Ontario and Quebec eclipsed the western provinces. Weak markets and high production costs dealt a heavy blow to British Columbian companies during the recessions of the early 1980s, while in Quebec and Ontario, federal aid designed to modernize the industry helped some eastern companies when the economy forced internal cutbacks. Recently, however, emphasis on capacity expansion has shifted the advantage back to resource-rich western Canada, and the need to improve environmental controls will force major improvements over the next several years at the region's large pulp mills. P&P's survey shows that 58% of planned spending is at western mills.

In the 1991 Statistics Canada survey, mills in British Columbia reported plans to spend \$1.3 billion in 1991,

down 14.6% from outlays of \$1.5 billion in 1990. The decline planned for 1991 follows gains of 5.5% in 1990 and 59.9% in 1989. In Quebec, companies reported plans to spend \$1.02 billion in 1991, down 9.6% from 1990 outlays of \$1.13 billion. Spending in the "other" provinces of Alberta, Saskatchewan, Manitoba, and the Maritimes was expected to drop 15.3% in 1991 to \$793 million. In Ontario, companies reported plans to spend \$710 million on capital improvements in 1991, down 7.6% from 1990 spending of \$769 million.

HISTORICAL PATTERN. The past ten years have been a roller coaster ride for capital spending in Canada. While efforts during the middle of the past decade were focused on cost containment and productivity improvement, spending plans in the late 1980s were driven mainly by capacity expansion, particularly in newsprint, market pulp, and fine papers. In 1989, newsprint producers began a huge buildup in capacity lasting into 1991. Chemical market pulp producers geared up for a similar glut of new capacity, although some projects were later delayed. Much of this pulp mill spending was funded by overseas interests, particularly the Japanese, who have found North America a cheap place to invest at current exchange rates. More so than in the U.S., capital spending in Canada got a boost from overseas investment. Of ten major expansion programs announced in 1988, five of the largest involved major investments by overseas papermakers.

Entrepreneurial investment has also been a major factor in Canadian spending plans. Led by Repap Inc., companies, such as Cascades and St. Marys Paper Inc., that have rescued and rejuvenated old mills are responsible for a share of spending out of proportion to their size. Another group of entrepreneurs has come in from

NEW CANADIAN MILL PROJECTS (metric tons)

STARTED UP IN 1991

Howe Sound Pulp & Paper, Port Mellon, B.C.
535-tpy TMP/newsprint mill; Valmet machine
Louisiana-Pacific, Chetwynd, B.C.
157,500-tpy bleached market CTMP

APPROVED OR UNDER CONSTRUCTION

Newtech Recycling , Coquitlam, B.C.	1992
122,500-tpy market deinked groundwood pulp	
Millar Western Pulp , Meadow Lake, Sask.	1992
240,000-tpy bleached market CTMP mill	
Alberta-Pacific Forest Industries , Athabasca, Alta.	1993
500,000-tpy bleached kraft market pulp	

PROPOSED (NO STARTUP DATE)

Consumers Paper, Redcliff, Alta.
25,000-tpy recycled tissue mill
Desencrage CDM, Cap-de-la-Madeleine, Que.
90,000-tpy market deinked pulp mill
Orenda Forest Products, Stewart, B.C.
173,000-tpy machine-finish coated paper mill
Orford Recycling, Drummondville, Que.
122,000-tpy market deinked pulp mill
Shin Ho Canada, Thunder Bay, Ont.
150,000-tpy bleached hardwood CTMP mill

outside the industry and built new capacity, especially in the West. Millar Western Pulp Ltd., for example, entered the industry by building a new chemi-thermomechanical market pulp (CTMP) mill in Alberta in 1988, and another mill is slated for 1992 startup in Saskatchewan.

Capacity growth rates have been higher than average in the Canadian industry since 1986, culminating in record expansion plans at the end of the decade. Business conditions began to sour in 1989, but the expansion boom continued to take shape, and in 1990, the industry found itself in the middle of a capacity expansion boom in its major grade segments as well as in a steep market downturn. Capital spending plans plunged, and the three-year outlook for capacity expansion dropped 20%. The expansion boom was originally expected to be much larger than it has turned out to be, although it is still larger than any growth period since the 1970s. Collapsing prices put the squeeze on newsprint companies in 1989, resulting in a series of project cancellations, postponements, shutdowns of high-cost capacity, and conversions to other grades that will continue into 1992.

SPENDING BY CATEGORY. In P&P's late 1991 survey of spending, Canadian companies reported plans to spend \$8.9 billion on capital projects during the 1991-93 period, down 12.1% from plans reported in January 1991 for the 1990-92 period. Production-related projects accounted for \$5.9 billion of overall spending, down 22.3% from the previous survey. Spending was down in every part of the mill, led by a 43.1% drop in installations of new paper machines. Pulp mill improvements, the largest category in dollar terms, totaled \$3.4 billion, down 23.9% from 1991.

Environmental expenditures climbed to \$3.0 billion for 1991-93, up 18.5% from plans reported for 1990-92. Spending for water quality improvements posted a 14.1% gain, following increases of 18.9% in 1991, 506% in 1990, and 122% in 1989. Water pollution control spending plans now total \$2.2 billion, comprising 72% of overall environmental spending plans. Companies reported air pollution control projects costing \$652 million for 1991-93, up 16.0% from last year. Spending for solid waste disposal is up by 162.5% to \$178 million, as mills earmark funds for sludge disposal projects.

Pulp mill spending accounts for 57% of current production related spending plans, totaling \$3.4 billion. In late 1991, Fletcher Challenge Canada and James River-Marathon Ltd. completed major improvement programs adding 75,000 tpy and 178,500 tpy, respectively. A 235,000-tpy expansion program at Celgar Pulp's Castle-gar mill is targeted for completion in mid-1992.

3 Bleached hardwood kraft pulp capacity will jump 391,000 tpy by 1992 to 1.36 million tons, a substantial 40.4% increase over 1989, according to the Canadian Pulp & Paper Assn. Most of the extra capacity will result from three sources: Daishowa Canada's new Peace River Pulp Co. mill in Peace River, Alta.; James MacLaren Industries' 75,000-tpy expansion at Thurso, Que., in 1990;

and Malette Inc.'s 1990-92 modernization program at Smooth Rock Falls, Ont., adding about 70,000 tpy of softwood and hardwood kraft output. Alberta-Pacific has begun construction of its \$1.3 billion bleached kraft market pulp mill in Athabasca, Alta. The 500,00-tpy facility is on target for startup in 1993.

Mechanical market pulp has been one of the fastest-growing sectors in Canada, but because of depressed markets, it is unclear exactly how much of the announced new capacity will actually be built. Poor markets have forced the shutdown of two recently opened facilities—Cascades' mill in Port Cartier, Que., and Donohue Matane in Matane, Que. Proposals still on the drawing board are being held back until market conditions improve.

Louisiana-Pacific Corp. completed its new 157,500-tpy bleached CTMP plant in Chetwynd, B.C., in early 1991. Millar Western Pulp is on track to complete its new 240,000-tpy bleached market CTMP plant in Meadow Lake, Sask., early this year. The facility will cost \$330 million.

Outlays for new paper machines drop 43.1% in this year's survey to \$751 million. No new paper machines are currently under construction in Canada, either at new or existing mills. Spending for paper machine rebuilds has also been hit hard by the economic downturn, dropping 14.5% to \$619 million for 1991-93.

Atlantic Packaging Products Ltd. brought a new 150,000-tpy newsprint machine online in early 1991, as did Canadian Pacific Forest Products (CPFP) and Kruger. CPFP's new 240,000-tpy No. 5 machine at Thunder Bay, Ont., will replace two older units for a 60,000-tpy net increase in capacity. Kruger's new machine at Trois Rivières, Que., will have capacity for 180,000 tpy, but about 70,000 tpy of the increase will be offset by conversion of No. 4 machine at Corner Brook, Nfld., to supercalendered paper production.

The final machine to come online in this round of expansions was at Howe Sound Pulp & Paper Co. Ltd.'s new 535-tpd mill at Port Mellon, B.C., which started up in July 1991.

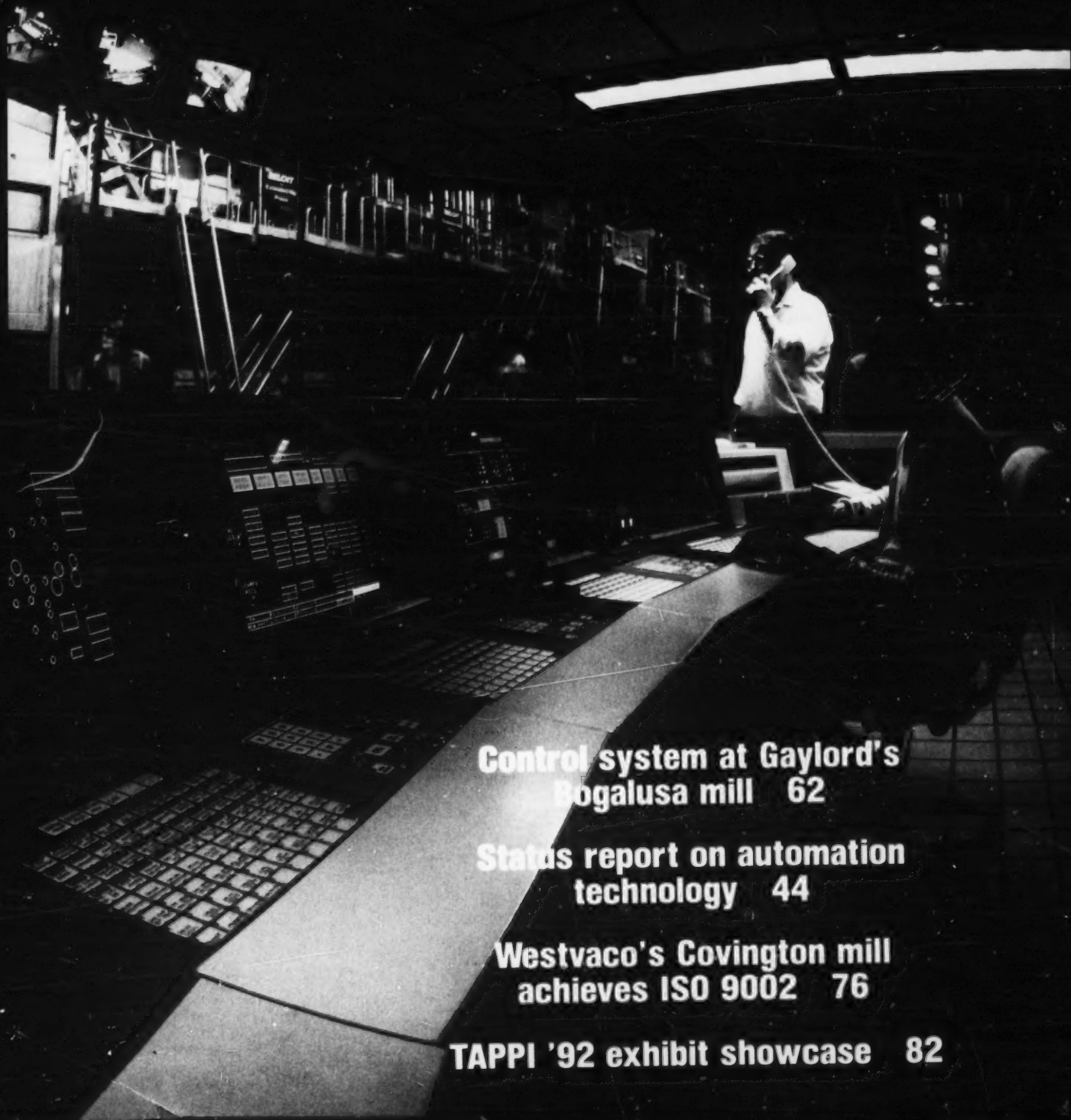
Four new machines will raise sanitary papers capacity by 31.4% to 666,000 tons in 1992. Atlantic Packaging Products, Whitby, Ont., and Irving Tissue Ltd., Saint John, N.B., each added a new machine early in 1990, and a third machine started up in early 1990 at Cascades' Kingsey Falls, Que., mill. In mid-1991, Perkins Paper Ltd. started up a new tissue unit at Candiatic, Que. ■

Complete results of P&P's exclusive survey of North American capital spending programs for 1992-93 are available in a separate **Mill-by-Mill Listings** report. Organized by company, the listings show programs for new mills and machines, rebuilds and modernizations, environmental quality control, and other mill improvements, with specifics on equipment ordered, dates, suppliers, and prices, where available. Subscribers to P&P's monthly newsletter, *Project Report*, receive a free copy of the report with their January issue. All others may obtain a copy of the report for US\$145. To order, send payment to Pulp & Paper, Editorial Dept., 600 Harrison St., San Francisco, Calif. 94107.

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This issue's focus on process automation includes a report on the single-window architecture for process control and information systems in use on Gaylord Container Corp.'s new No. 8 linerboard machine at Bogalusa, La. The cover photo shows the mill's operators inside the new control room on the No. 8 machine room floor. (Photo courtesy of Gaylord Container Corp. and Honeywell Inc.)

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PULP & PAPER (ISSN 0033-4081) [Canadian GST permit number 124513185], with which is combined Paper Mill News, Paper Trade Journal and Pacific Pulp & Paper, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean, US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00, 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48016; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. Send subscription correspondence to: Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.

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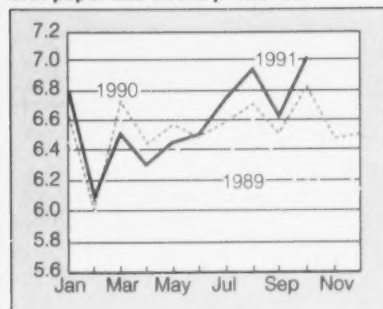
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U.S. paper and board production



U.S. production of paper and paperboard totaled 7.0 million tons in October 1991, up 2.9% from the previous year, according to the American Paper Institute. The seasonally adjusted rate of production stood at 79.2 million tpy through the first ten months, up 0.7% from the same period in 1990. Paperboard production was up a seasonally adjusted 2.0% to a 40.0-million-tpy rate, while paper output was off 0.6% to 39.2 million tpy. Strong exports were responsible for the strong showing, which comes in the face of continued weakness in the domestic economy.

Among major grades, renewed strength in the printing and writing sector gave paper output a boost. Uncoated groundwood and free-sheet grades both set record monthly highs, although shipments for the year still lag year-earlier levels. Containerboard production for the domestic market was up 0.5% through October, but production for export posted a 19.5% increase. Fiber box shipments were up 1.9% for the month, keeping pace with 1990 for the year to date.

Canadian newsprint shipments totaled 735,000 metric tons in October, up 3.5% from a year earlier, while market pulp shipments rose 1.3% to 727,000 tons. Operating rates dropped to 79% at newsprint mills and 86% at pulp plants for the year through October.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Oct.	584	3.7	6,812	3.7
Uncoated groundwood (s)	Oct.	163	-3.0	1,790	-0.8
Coated paper (s)	Oct.	672	-2.5	7,345	-3.3
Uncoated free-sheet (s)	Oct.	1,081	7.1	11,631	0.6
Other printing/writing	Oct.	129	-5.1	1,485	-6.1
Total packaging and other paper (s)	Oct.	388	-5.6	4,483	-2.7
Tissue	Oct.	486	-4.1	5,697	-1.9
Total paper	Oct.	3,505	0.6	39,242	-0.6
Unbleached kraft paperboard	Oct.	1,823	3.9	20,829	2.9
Semichemical medium	Oct.	489	1.9	5,676	-0.2
Bleached paperboard	Oct.	376	8.7	4,586	3.5
Recycled paperboard	Oct.	834	9.2	9,099	0.6
Total paperboard	Oct.	3,521	5.3	40,190	2.0
Total U.S. paper and paperboard output	Oct.	7,026	2.9	79,432	0.7

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Oct.	5,458	5.0	63,771	1.2
Market pulp production	Oct.	776	5.7	9,029	1.8
Wastepaper consumption at paper/board mills	Oct.	1,935	8.4	21,810	3.6
Pulpwood consumption (cords)	Sept.	7,871	-4.5	98,636	-0.6

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ³)	Oct.	31.334	1.9	271.378 ^a	0.0
Containerboard inventories at U.S. box plants and mills	Sept. 30	2,539	-1.2		

INTERNATIONAL TRADE⁴

U.S. paper imports (including products)	Sept.	967	-2.1	11,996	-8.2
Imports of Canadian newsprint	Sept.	571	-1.4	7,446 ^a	-9.6
U.S. paper exports (including products)	Sept.	700	20.7	8,308	21.2
Exports of unbleached kraft linerboard	Sept.	241	12.6	3,027	12.9
Exports of woodpulp	Sept.	517	-1.7	6,365	6.3
Norscan pulp inventories ⁴	Oct. 31	1,462	2.9		
Norscan pulp operating rates ⁴	Oct.	88%	75%	89%	86%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Oct.	735	3.5	7,232 ^a	-5.4
Operating rates	Oct.	79%	78%	87%	90%
Inventories held by U.S. consumers	Oct. 31	1,324	4.3		
Other paper/board shipments	Oct.	696	1.3	6,246	0.0
Woodpulp shipments (export only)	Oct.	727	1.3	7,007	10.0
Operating rates	Oct.	86%	88%	87%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Tissue: Producers strive to overcome impact of premium bath tissue decline

Grade structure: The tissue market includes two major sectors: sanitary and "other." Sanitary products form the larger category and include bathroom and facial tissue, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group accounts for just 2% of the market, and includes basestock for waxing, wrapping, and miscellaneous uses. The two major outlets for tissue are consumer, and commercial and industrial (C&I). Consumer tissue accounts for nearly two-thirds of the market and is purchased at retail outlets. Industrial tissue goes to hotels, offices, restaurants, factories, and institutions. Consumer tissue growth is expected to be less than half that of commercial products over the next few years. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

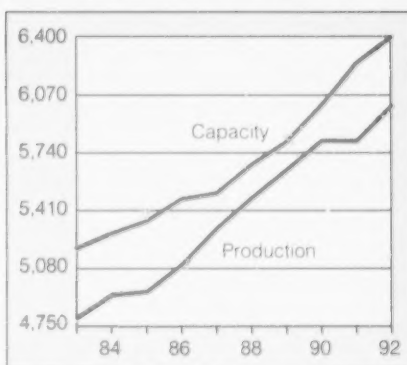
Production/capacity: Tissue production in 1990 reached 5.802 million tons and stood at an annualized rate of 5.681 million tons for the first nine months of 1991, down 1.7% from the same period a year earlier. Operating rates reached 96 to 97% in 1990 and 93 to 94% through September 1991. These rates were kept up in spite of a number of expansions. In March 1991 Fort Howard Corp. expanded its Savannah River Mill in Rincon, Ga., by 30%, or an estimated 88,000 tpy, with the tissue going primarily to the C&I market. The company is also building a new machine at its mill in Green Bay, Wis., that is due online in first-quarter 1993. Mosinee Paper Corp. started up a rebuilt 60,000-tpy toweling machine at its Bay West Paper Corp. unit in September and was also working on a new tissue machine to start around the turn of the year. Scott Paper Co. has approved a land purchase near Owensboro, Ky., on which to build a \$300-million-plus tissue mill, with site prep to begin in February or March.

Outlook: Producers in both the consumer and C&I sectors were chilled by the 1990-91 recession. Tissue markets became more competitive as demand slowed and as new products—in particular, Kimberly-Clark Corp.'s new Kleenex premium consumer bath-

room tissue, produced at a new mill in Jenks, Okla.—churned up the market. In the C&I sector, a new mill in 1990 from K-C in Loudon, Tenn., and Fort Howard's new Rincon, Ga., capacity weakened the market, noted George Adler, an analyst with Smith Barney. Harris Upham & Co. The recession also reduced employment, cutting down on C&I demand. However, with other producers adjusting to K-C's presence in premium bath tissue and with the economy improving, the industry's prices and profits could pick up this spring. Jeanne Carroll, an analyst with Morgan Stanley & Co. Inc., believes the sector will remain favorable over the next few years because of limited new supply and favorable pricing of raw material.

Prices: K-C's reemergence into the premium consumer bath tissue business in September 1990 sparked a round of promotional activity among its competitors, forcing down producers' margins significantly. In mid-1991, market leader Procter & Gamble Co. dropped list prices and sheet counts on its Charmin and White Cloud brands. Scott, James River Corp., and K-C followed P&G's lead with varying combinations of price and/or sheet count reductions over the next several months. However, by January 1992 P&G managed to reduce trade promotion allowances on Charmin and White Cloud in an effort to rebuild margins. In general, consumer towel and facial tissue prices have not suffered a similar decline, though promotions did heat up some towards the end of 1991 because of high inventories, said Carroll. Across-the-board price hikes of 5% announced at the end of August 1991 for C&I tissue have yet to be put through, she added. Because of the highly competitive market for consumer tissue paper, the price of tissue paper per ton is not readily available. Price trends tracked by the Bureau of Labor Statistics' Producer Price Index (PPI) show relative changes in price levels. Note that this is not a dollar/ton price. The PPI for converted sanitary paper products, including unconverted stock, is as follows (1982 = 100): 1987, 109.1; 1988, 115.0; 1989, 126.0; 1990, 135.4; 1991 (November), 136.5. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990	1991e	1992e
Production	5,802	5,800	6,000
Capacity ¹	6,005	6,241	6,390
Utilization rate	96.6%	92.9%	93.9%
Imports ²	131	80	80
Exports ²	35	60	55
Apparent U.S. consumption	5,898	5,820	6,025
lb/capita	47.2	46.1	47.3
GNP ratio	1.42	1.41	1.43

e = Estimate.

1. American Paper Institute data. 2. U.S. Dept of Commerce data.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Scott Paper	1,150	18.0
2. James River	1,100	17.2
3. Fort Howard	1,030	16.1
4. Procter & Gamble	810	12.7
5. Georgia-Pacific	567	8.9
6. Kimberly-Clark	550	8.6
7. Chesapeake	190	3.0
8. Pope & Talbot	145	2.3
9. Potlatch	120	1.9
10. Orchids Paper	110	1.7

Market share of top five companies:

72.9%

Market share of top ten companies:

90.3%

Total U.S. capacity (1991):

6,390 million short tons

CAPACITY

U.S. industry to add 7.4 million tons by 1994

Over the next three years, U.S. pulp and paper companies plan to add 2.5 million tons of new woodpulp production capacity and 4.9 million tons of new paper and paperboard capacity. With these additions, U.S. paper and board capacity will increase at a 1.9% annual rate and reach 91.9 million tons in 1994. This annual rate of capacity growth during 1992-94 will be lower than the 3% increase in U.S. paper and paperboard capacity in 1991, which followed a 2.7% increase in 1990. The reduced level of investments in new production facilities reflects the current conservative business climate along with the escalating spending on environmental projects that contributes very little, if anything at all, to increased industry output, said American Paper Institute president Red Cavaney at a news conference held last week in New York City.

The API's annual capacity survey also projects new investments in recycling facilities and greatly expanded use of wastepaper in the manufacture of paper and paperboard. Wastepaper use is forecast to increase by almost 5 million tons between 1991 and 1994, based on already installed or approved additions to recycling operations. Wastepaper consumption at U.S. mills is expected to increase to 28.7 million tons in 1994. With these planned expansions, wastepaper will contribute more than 30% of the industry's raw material supply in 1994 and will require a major increase in municipal and private collection programs. This expanded level of activity shows substantial progress toward the industry's current voluntary goal of recovering a full 40% of the nation's paper consumption for domestic recycling and exports by 1995, Cavaney commented.

Fewer new machines. For the first time in several years, capacity increases from machine rebuilds and other improvements to existing facilities will exceed capacity additions from new paper machines or greenfield mills.

Over the next three years, nine new paper machines with total nameplate capacity of 1.3 million tons will be brought into production. Only one

of these machines will be located in a new greenfield mill, which is now under construction by Temple-Inland Inc. During the preceding three-year period of 1989 to 1991, 28 new ma-

chines with total capacity of almost 5 million tons were brought into production, and a significant number of these machines were placed in greenfield mills.

U.S. PAPERBOARD ANNUAL CAPACITY, 1991-94
Practical maximum basis (000 short tons)

Grades	1991	1992	1993	1994
Total all grades	89,056	91,062	92,703	93,979
Total paper/board	86,960	88,966	90,604	91,880
Total paper	43,766	44,981	45,696	46,362
Newsprint	7,069	7,288	7,380	7,409
Printing/writing	25,119	25,945	26,435	26,983
Uncoated groundwood	1,923	1,930	1,933	1,934
Coated groundwood	4,426	4,463	4,520	4,547
Coated free-sheet	4,031	4,268	4,463	4,616
Uncoated free-sheet	12,981	13,482	13,709	14,072
Cotton fiber	204	205	205	205
Thin papers	225	255	255	255
Bleached bristols	1,299	1,342	1,350	1,354
Packaging and				
industrial converting	5,337	5,358	5,345	5,337
Unbleached kraft	2,703	2,690	2,653	2,633
Bleached kraft	484	485	488	493
Specialty packaging	692	710	722	723
Special industrial	1,458	1,473	1,482	1,488
Tissue	6,241	6,390	6,536	6,633
Total paperboard	43,194	43,985	44,908	45,518
Unbleached kraft	21,986	22,353	22,369	22,562
Kraft linerboard	19,989	20,309	20,293	20,466
Solid bleached	4,886	4,967	5,122	5,353
Semichemical	5,957	6,025	6,069	6,097
Recycled	10,365	10,640	11,348	11,506
Containerboard	2,900	3,099	3,717	3,811
Construction paper and board	2,096	2,096	2,099	2,099

U.S. MARKET WOODPULP CAPACITY, 1991-94
Practical maximum basis (000 short tons)

Grades	1991	1992	1993	1994 ¹
Total market woodpulp	10,189	10,815	11,085	11,140
Dissolving	1,500	1,507	1,509	1,517
Chemical paper grades	8,689	9,308	9,576	9,623
Sulfite paper grades	309	309	314	315
Sulfate paper grades	8,380	8,999	9,262	9,309
Bleached softwood	5,068	5,478	5,705	5,753
Bleached hardwood	3,130	3,328	3,362	3,362
Unbleached	182	193	195	195

1. Capacity additions presented here for 1994 include only presently known commitments and do not necessarily represent final expansion plans of the industry for that year.

Source: American Paper Institute.

While only one new greenfield paper mill is scheduled for startup in 1992-93, three new world-class pulp mills with annual capacity to produce nearly 1 million tons of bleached sulfate market pulp are scheduled to begin production during 1991-92. Two of the mills constructed by Stone Container Corp. and Union Camp Corp. are now in production. A third mill currently under construction by Alabama Pine Pulp Co. will be brought online in 1992. By 1994, the U.S. industry capacity to produce market pulp will reach 11.1 million tons, with chemical paper-grade market pulp accounting for 86.4% or 9.6 million tons of the total.

Woodpulp. Growth in total woodpulp capacity follows a trend similar to paper and paperboard, with lower expansion rates in future years after back-to-back annual increases of 2.2% in 1991 and 2.4% in 1992. During 1993 and 1994, total woodpulp capacity is expected to increase at a rate of only 0.7%/year.

As a result of the increased use of wastepaper at U.S. paper and board mills, consumption of woodpulp and other miscellaneous fibers is projected to only increase by 1.8% annually between 1990 and 1994. This compares with a strong 6.8% average annual increase in wastepaper consumption during the same period.

A growing demand for paper products containing recycled materials has stimulated an expansion in deinked market pulp capacity. Based on publicly announced projects, capacity for deinked market pulp is expected to increase from an estimated 325,000 tons in 1991 to about 1 million tons in 1994. At the same time, the number of producers of deinked market pulp will increase from just three companies to as many as eight companies by 1994.

Newsprint. The startup this year of North Pacific Paper Co.'s new 245,000-tpy machine is contributing to a rapid rate of expansion in U.S. newsprint capacity. Between 1989 and 1991, five new machines were brought online and capacity has increased by 16% or 954,000 tons during this period to reach 7.1 million tons this year. This rapid capacity buildup now appears to be subsiding, although 340,000 tons of new capacity, mostly residual gains from earlier expansions, will be added during 1992-1994.

Also, the newsprint industry is stepping up its recycling capabilities to

GROWTH TRENDS IN U.S. CAPACITY (000 short tons)				
Grades	Additions 1992-1994		Additions 1981-1991	
	3-year increase	Average annual growth	10-year increase	Average annual growth
Total all grades	4,923	1.8%	16,801	2.1%
Total paper/board	4,920	1.9	18,787	2.5
Total paper	2,596	1.9	10,059	2.6
Newsprint	340	1.6	1,612	2.6
Printing/writing	1,864	2.4	7,817	3.8
Uncoated groundwood	11	0.2	298	1.7
Coated groundwood	121	0.9	1,379	3.8
Uncoated free-sheet	1,091	2.7	4,153	3.9
Coated free-sheet	585	4.6	1,786	6.0
Packaging and industrial converting	—	—	(576)	(1.0)
Tissue	392	2.1	1,206	2.2
Total paperboard	2,324	1.8	8,728	2.3
Unbleached kraft	576	0.9	5,248	2.8
Kraft linerboard	477	0.6	4,617	2.7
Solid bleached	467	3.1	745	1.7
Semichemical	140	0.8	969	1.8
Recycled	1,141	3.5	1,766	1.9
Containerboard	1,086	9.5	1,061	4.7
Construction grades	3	—	(1,986)	(6.4)
Total all grades	2,488	1.2%	10,571	1.7%
Total woodpulp for paper and board	2,488	1.2	11,905	2.0
Dissolving	—	—	(105)	(0.7)
Sulfite	(46)	(0.9)	(158)	(0.9)
Sulfate	2,633	1.7	10,632	2.3
Bleached	2,785	3.1	8,754	3.6
Unbleached	(152)	(0.2)	1,931	0.9
Semichemical	(74)	(0.5)	(50)	(0.1)
Mechanical	(25)	(0.1)	1,586	2.6
Construction grades	—	—	(1,334)	(11.0)
Total all grades market woodpulp	951	3.0%	3,217	3.9%
Chemical paper grades	934	3.5	3,314	4.9

() = decrease.
Source: American Paper Institute.

meet publishers' demands for recycled-content newsprint. At least 13 new deinking plants are now in varying stages of construction or under active study at existing newsprint mills. These projects will increase recycling of old newspapers and magazines by an additional 1 million tons by 1994. In addition, five completely new recycled newsprint mills are now under study. Although none of these projects have yet been approved, they have the potential of recycling ap-

proximately 1.3 million tons of wastepaper, according to API.

Printing and writing papers. U.S. industry capacity to produce printing and writing papers will grow at an annual rate of 2.4% during 1992-94, reaching nearly 27 million tons in 1994. Capacity growth will be led by the uncoated free-sheet grades, which will add 1.1 million tons of new capacity for an average annual increase of 2.7%. Coated free-sheet grades will add 585,000 tons for an

annual increase of 4.6%. New machines are planned by Consolidated Papers Inc. and Champion International Corp. During the last two years, six new machines with capacity to produce 1.6 million tons of uncoated and coated free-sheet papers began production.

Although planned capacity expansions for printing and writing papers will trail historical levels, consumption of wastepaper at these mills will increase by an estimated 32% by 1994. Much of the increased use of recovered wastepaper will be in deinked grades, with consumption expected to increase 14.7% annually during the next three years.

Tissue. Capacity for the household and commercial tissue grades will grow at an annual average rate of 2.1% during the next three years. This rate will add 392,000 tons of capacity and bring the industry total to 6.6 million tons in 1994. This tissue expansion includes the startup of five new paper machines that will provide 75% or 292,000 tons of the total increase. Three of these machines are designed to use wastepaper. As a result, wastepaper consumption at tissue mills will increase by 453,000 tons by 1994.

Containerboard. Estimates for future containerboard capacity have recently been revised downward. For 1993 alone, total capacity has been reduced by 595,000 tons, mostly for un-

bleached kraft linerboard, but also for recycled corrugating medium. Projects with longer lead times have been delayed or cancelled, while committed projects with shorter lead times and less flexibility have gone ahead. For example, Lin Pac Inc. is on schedule with construction of a 90,000-tpy recycled linerboard mill for startup in March of 1992, and Temple-Inland Inc. is on schedule for the startup of its new 210,000-tpy greenfield recycled linerboard mill sometime in late 1992.

Meanwhile, a greenfield mill with capacity to produce 350,000 tpy of recycled containerboard that was proposed by Daishowa America Co. Ltd. and Trans-Rim Enterprises Ltd. has been indefinitely postponed. In addition, in early 1991 Gaylord Container Corp. shut down two paper machines with total capacity of 300,000 annual tons of kraft linerboard and recycled corrugating medium.

Taken as a whole, capacity for containerboard should reach 30.6 million tons in 1994, and the rate of growth should average 1.7%/year over the period 1992-94. As with other paper grades, wastepaper use will expand rapidly from a base of 7.8 million tons in 1991 to an estimated 9.7 million tons in 1994. The rate of increase in wastepaper consumption will be approximately 8%/year through 1994, and old corrugated containers will comprise 95% of the total.

Bleached and recycled boxboard. The recent decision from Westvaco Corp. to delay the installation of a new bleached paperboard machine at its Covington, Va., mill from 1992 to late 1993 will lower the growth rate for solid bleached sulfate (SBS) to a 3.1% average annual rate. While lower than last year's estimate, total capacity will still climb to 5.4 million tons in 1994. Most of the incremental capacity growth in 1992 and 1993 will come from machine rebuilds and improvements that have been completed during the last two years.

Although much focus has been directed to the recycled containerboard grades, more than 70% of all recycled paperboard is converted into folding cartons, rigid setup boxes, tubes, cans, drums, and other packaging and non-packaging products. Capacity to produce these grades will increase approximately 1%/year from about 7.5 million tons in 1991 to 7.7 million tons in 1994.

Consumption of wastepaper, which provides virtually 100% of the raw material for these recycled grades, shows a corresponding increase from 7.5 million tons in 1991 to an estimated 8 million tons in 1994.

The API 1991 Capacity Survey is available for \$375 in the U.S. and \$395 overseas from Dept. CMS, American Paper Institute, 260 Madison Ave., New York, N.Y. 10016. Phone: (212) 340-0600. Fax: (212) 689-2628. ■

UNCOATED FREE-SHEET

Willamette plans 600-tpd machine for Penntech

Willamette Industries Inc. said last month that it will install a 600-tpd uncoated free-sheet paper machine at its Penntech mill in Johnsonburg, Pa. The machine is slated to produce specialty papers plus some commodity grades when it comes online by late 1993. The new Valmet machine will join five others at Penntech and is smaller than the one Willamette installed at its greenfield mill in Bennettsville, S.C. in 1990. The new Penntech machine will have a 232-in. trim and top-rated capacity of slightly over 200,000 tpy, according to spokeswoman Cathy Baldwin.

Willamette acquired the 400-tpd Penntech mill a little over two years ago. Since then, it has been researching operations and working to initiate a number of needed improvements at

the facility.

Last year, the company said it was looking at a variety of capital projects, including a possible new uncoated free-sheet machine at Hawesville, Ky., and various improvements to Penntech. Projects underway at the mill include a new water effluent treatment system, a new recovery boiler, and a steam turbine cogeneration plant. Additional operations already in progress include the installation of new winders, a new lime kiln, and a recausticizing unit. These projects are scheduled for completion in December 1992.

Not including the Penntech project, U.S.-based uncoated free-sheet paper capacity is expected to rise about 2.7%/yr. or almost 1.1 million tons, in the 1992-94 period, according

to the American Paper Institute's most recent capacity survey. API projects 1993 capacity at just over 13.7 million tons, rising to almost 14.1 million tons in 1994.

The only other new machine due online between now and the end of the survey period is Champion International Corp.'s 240,000-tpy project at Courtland, Ala., which is also scheduled for a late 1993 startup. However, there is remaining new capacity from recent startups at Boise Cascade Corp. at International Falls, Minn.; Union Camp Corp. at Eastover, S.C.; and Georgia-Pacific Corp. at Ashdown, Ark. Along with this, there is additional competition from new machines in Mexico and Brazil, plus existing capacity in Canada and Finland, among others. ■

Quality Awareness, Mill Acceptance Intensifies In N.A. Paper Industry

Survey of quality management practices shows more mills are implementing quality programs and expanding their knowledge of emerging quality standards

By KELLY H. FERGUSON, Deputy Editor

More and more North American pulp and paper mills are discovering the benefits of quality control/quality management programs, and even though they lag behind some other industries in full implementation, awareness of these benefits is growing quickly. In tight economic times, such as the current industry downturn, mills are finding that quality programs can better streamline and improve their process and that exhibiting the "badge" of quality can help attract potential customers.

More mills are also paying attention to the quality system standards set forth in both the International Standards Organization's (ISO) 9000 series and the U.S.'s Malcolm Baldrige Award. Westvaco Corp.'s Covington, Va., mill, for example, became the first North American mill to meet the quality system standards of ISO 9002 and become certified (see mill profile, p. 76). Westvaco's management said it recognizes the opportunity of selling its bleached board in foreign markets and thus under-

took the time-consuming process of registration.

A *Pulp & Paper* survey of North American quality control/quality management practices indicates that mills continue to search for the correct combination of quality tools, employee interest, and management commitment. Most mills surveyed remain in the very early stages of implementation but are quickly learning about the frustration and rewards that come with cultivating a quality management program.

The 1992 survey queried mills about their efforts to implement quality programs, use of quality tools, sources of information for program development, process areas best suited for specific quality efforts, and thoughts on leaders in the quality field. The results of this year's survey are compared, where appropriate, with the results from a similar survey published last year (*P&P*, Mar. 1991, p. 71).

The 1992 survey covers a wide range of mills within the pulp and paper industry of North America:

- Mills from 24 U.S. states and five provinces in Canada
- Twelve major pulp, paper, and board grade mills
- Mill sizes ranging from 5,000 tpy to 800,000+ tpy

Quality leaders

Just as in the 1991 survey, this survey asked respondents to name quality leaders within the pulp and paper industry and also some outside the industry.

Pulp and paper quality leaders:

Chesapeake Corp.
Consolidated Papers Inc.
Container Corp. of America
Daishowa Inc.
Dexter Corp.
Eastman Kodak Co.
Federal Paper Board Co., Inc.
International Paper Co.
James River Corp.
Kimberly-Clark Corp.
Kruger Inc.
MacMillan Bloedel Ltd.
Mosinee Paper Corp.

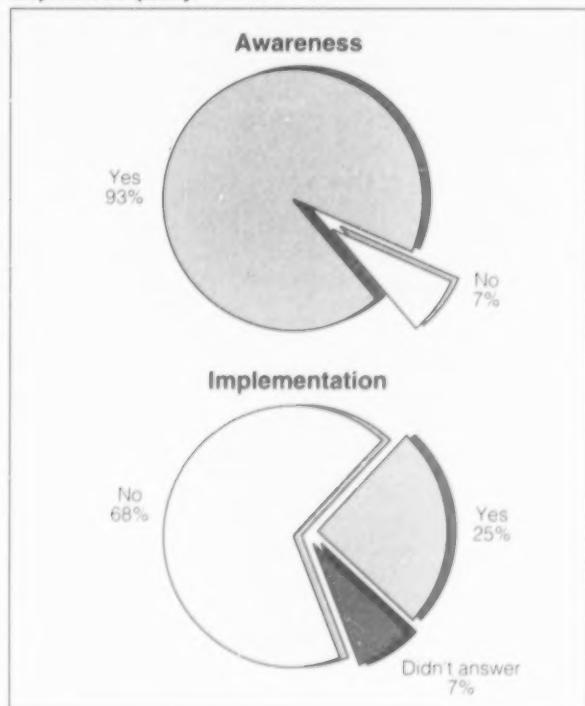
Prince George Pulp & Paper
Procter & Gamble Paper
Products Co.
Quebec & Ontario Paper Co.
Scott Paper Co.
Jefferson Smurfit Corp.
Stone-Consolidated Inc.
Union Camp Corp.
S.D. Warren Co.
Westvaco Corp.
Weyerhaeuser Paper Co.
Willamette Industries Inc.

Other quality leaders:

3M
Asten Hill
AT & T
B.F. Goodrich
Cadillac
Cannondale

Chrysler
Dole Foods
Du Pont
Federal Express
Florida Power & Light
Ford
General Electric
Harley Davidson
Hewlett-Packard
Honda
IBM
McDonald's
Milliken
Motorola
Nissan
RJR Nabisco
Toyota
United Parcel Service
Volvo
Xerox

FIGURE 1: Awareness and implementation of such quality standards as those associated with the ISO 9000 series and the Malcolm Baldrige Award are on the rise in the North American paper industry, indicating companies are putting more emphasis on quality.



• Respondents from quality control and technical departments, as well as some mill general managers and process engineers.

QUALITY PROGRAMS MULTIPLYING. The majority of mills (90%) responding to the survey said they had some type of active, ongoing quality program. However, what constitutes a quality improvement/quality management program was basically left to the respondents' discretion—a complete program for one mill could be the use of only a minor improvement tool for another.

Of mills that said they have some type of quality program, most combine the "tools" as a foundation for their efforts. Statistical process control/statistical quality control (SPC/SQC) remains a favored method to achieve improvements and consistency, with 50% of mills saying they use it as part of their overall program. This represents an increase over the 1991 survey from 43.5%.

Quality improvement teams (42%) was the second most-used method, followed by total quality management (25%) and quality circles (8%). Other methods listed by respondents included daily or monthly quality meetings, quality councils, and ISO-9000 guidelines. Since most mills use a combination of these programs, these percentages do not equal 100%.

Mills are becoming more aware of such structured

quality standards as the previously mentioned ISO-9000 standards and Malcolm Baldrige award. Ninety-three percent of respondents said they are aware of these systems, significantly higher than the responses in the 1991 survey, and 25% said they had implemented a structured system—most using the ISO standards.

As stated previously, North American pulp and paper mills seem to be only in the beginning stages of true quality implementation. The largest number of mills, when asked the year their quality program began, said the second half of the 1980s (43%), and most of those were in the years of 1988 and 1989. The trend of more mills instituting quality programs is evidenced by the increase in respondents who said that such programs had been started at their mills in the 1990s—17% said the 1990s in last year's survey compared with 28% in this year's survey. Also, only 20% of the respondents said they had no program or gave no date of implementation, compared with 35% in 1991.

Mills continue to keep their program development in-house, relying less on consultants and even corporate assistance. Fifty percent of the respondents said their program was developed in-house only, and 81% said they were involved in development at some level. Of the two other groups that were sole sources for program development—corporate and consultants—about 9% of the mills used consultants alone and about 7% used corporate staff only. Other programs were developed by mill/corporate, mill/corporate/consultant, and mill/vendor teams.

All quality experts attest that management is the key to true quality manufacturing and service. Whether a company is truly quality conscious depends on the commitment of top level management to the quality program. But experts also agree that employees must share in the commitment as much as management.

Compared with the 1991 survey, quality programs are beginning to take a better hold at paper mills, and upper management is leading the way (Figure 1). Mills were asked first to rate how firmly established their quality control program was on a scale of 1 (almost nonexistent) to 5 (well established), and then to rate the level of commitment (1=limited commitment, 5=total commitment) of three major groups: top management, supervisors, and operators.

Of the mills that have a quality program, only 3% said their program was almost nonexistent, compared with 15% in 1991 (Figure 2). A larger number of mills feel they are at a level of medium involvement (43% in 1992 vs 31% in 1991). However, the number of respondents that feel their program is well established has declined (7% in 1992 vs 12% in 1991). One possible reason for this drop is that quality leaders in the mills are learning more about what is involved in truly establishing a quality program at mills.

Upper management seems to be getting more involved, with 30% having total commitment to quality programs and 48% having heavy commitment. That

compares with 24% total commitment and 31% heavy commitment in 1991. It is at the supervisory and operations level where commitment declines. But since it is management that must set the example for others in the company, these numbers are not unexpected. Supervisors and operators, according to respondents, are basically at a medium commitment level (48%). However, supervisors, as expected, are at a higher commitment level than operators.

Before commitment can be made to the quality program, operators must be involved in that program. Asked how important operator involvement is in a quality program, the majority of respondents (85%) said extremely important (Figure 3) and 12% said highly important.

Respondents were then asked to what extent their own mill operators were involved. Even though involvement seems to improve, operators are still far below the desirable level of most respondents. Only 12% said their operators were very involved; 23% claimed heavy involvement. Most respondents said operators were at the level of medium involvement (33%), slight involvement (20%), or limited involvement (12%). Those numbers match up to the 1991 survey as follows: very involved (9%), heavy involvement (13%), medium involvement (45%), slight involvement (28%), and limited involvement (6%).

Other aspects of mill quality programs include the following:

- Sixty percent said they have a written quality policy, compared with 48% in 1991.
- Twenty-seven percent said they have a written quality manual, compared with 35% in 1991 (this decrease can only be explained by the mix of participants between years although responses for most questions have remained closely linked).

Of mills that do have a written quality policy, 81% said they developed it in-house; 19% said they collaborated with consultants.

Competition is the driving force behind mill quality programs (cited by 70% as a factor), followed by cost savings (30%) and strategy (30%).

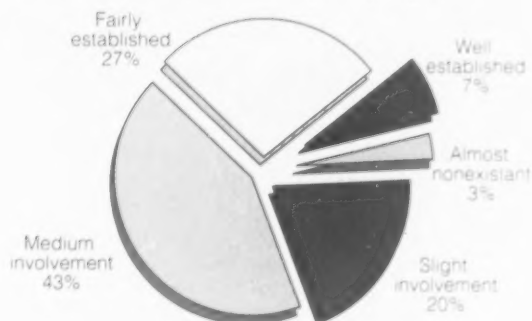
Since many mills cited a combination of these forces, the numbers do not add up to 100%. Other factors listed include customer demand, top management, and conformance to corporate mandate.

QUALITY TOOLS AND PROGRAM EMPHASIS. At one time, end-product testing was the only real method of quality determination for any manufacturing operation. And while testing is still very prevalent and necessary today, mills are adding quality tools to ensure high-quality raw materials and reduce process variability.

Nearly all (98%) mills use end-product testing as one of their primary methods for determining quality (Figure 4). However, raw materials testing (75%) and vendor certification (42%) are being used more frequently to track incoming materials, while process control systems (77%) and SPC/SQC (62%) are helping operators maintain consis-

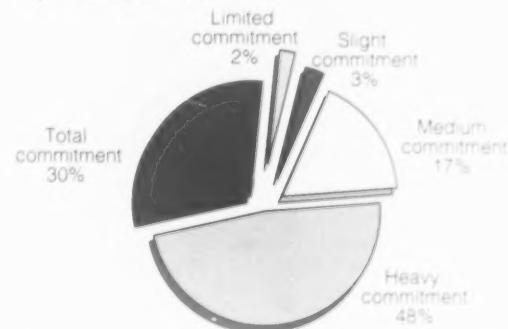
FIGURE 2: Quality programs are taking hold in the industry, with upper management leading the way. But because such programs are so new, the commitment has not filtered down to supervisors or operators.

How firmly established is your program?

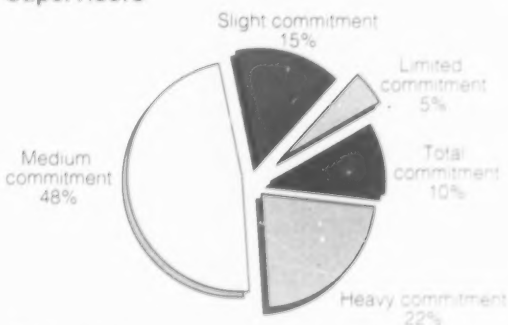


How committed are these groups?

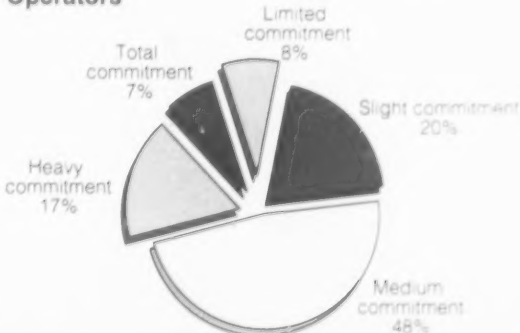
Top management



Supervisors



Operators



tency throughout the paper and boardmaking process.

Indeed, based on a scale of 1 to 5, 85% of respondents said process automation was "fairly important" to "very important" (3 to 5) for their quality control program. This percentage is a significant increase over the 76% that responded similarly in the 1991 survey.

Control charts are used by many mills to analyze and maintain process consistency. The survey showed that 37% of the mills chart manually, 12% use automated methods, 26% use a combination of manual and automated charting, and 25% did not use control charts.

Besides specific process tools, mills were asked what sources of information they turned to for reference and refining of their quality control programs. Conferences and seminars (68%) and associations (65%) were two of the most important sources, followed by training programs (63%) and trade magazines (60%).

Mills were also asked what specific process areas were focused on when using their quality control/improvement programs and were then asked what process areas could most benefit from such programs. Not surprisingly, answers were similar for both questions. Some of the projects follow:

- **Woodyard:** chip quality, chip thickness screening, and purchased chip quality improvement
- **Pulp mill:** online kappa digester control, improved control of refiners, pulp brightness, bleach plant brightness control, pH control in the bleach plant, and stock blending
- **Paper mill:** color control, cross direction weight and moisture control, stock prep system, gloss control, CSF calibration, porosity control, paper machine centerlining, forming area, roll uniformity, strength improvements, improved retention, coating solids, surface size solids, par-

FIGURE 4: Although product testing remains a major method of determining quality, process monitoring and raw materials testing are becoming more prevalent.

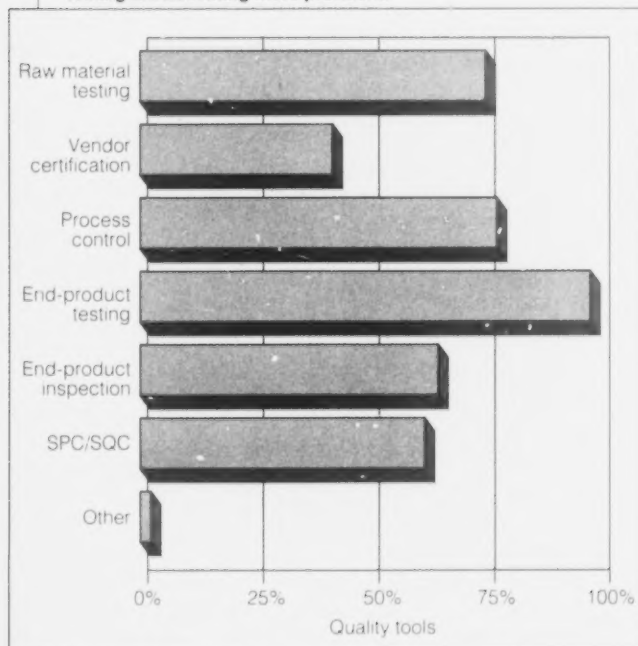
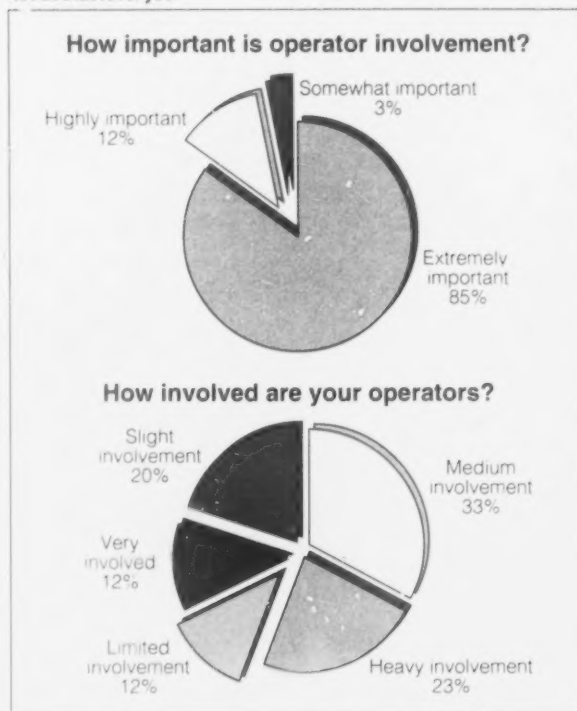


FIGURE 3: Most survey respondents felt operator involvement was of prime importance in their quality programs, but most are not at that level yet.



ent roll storage and handling improvements, rewinder workmanship, and reduced surface contamination.

THE QUALITY CHAIN. Customers are the driving force in industry, and no less so with quality control. If a customer demands that a mill show evidence of quality control efforts, mills are pushed to implement some type of program. The same should be true for paper mills and their suppliers. Thus, a quality chain is formed that continues to work back as far as the links (suppliers) in that chain can be pressured.

When asked if customers require them to have some form of quality program other than finished product testing, 40% of respondents said "yes". That same 60/40 split was true in the 1991 survey. On the other end of the relationship, only 13% of respondents said they required quality programs from their suppliers. That number has actually decreased from 27% in the 1991 survey.

Other "quality chain" elements follow:

- Thirteen percent said their customers require quality data on product shipments, and 68% said it depends on the customer. Of that quality data, most comes in the form of averages and standard deviation and/or raw data.
- Thirteen percent said their customers required process data.
- Sixty-eight percent of the mills said they require quality data on product shipments from their suppliers. ■

Paper Industry Salaries Ride Cycle to New High with Median of \$57,000

Recent expansion, capital spending boom pays off for industry engineers, but job morale continues to decline with economic downturn

By KELLY H. FERGUSON, Deputy Editor

Reflecting the peak of several years of expansion and growth in the pulp and paper industry, professional salaries seem to have made a significant leap just as the industry downturn began, according to *Pulp & Paper's* 1991 salary and opinion survey. But at the same time the industry has turned down, job morale has also taken a dive and a slightly larger percentage of respondents say they dislike their current job.

The 1991 survey indicated a median salary (without bonuses, etc.) of \$57,000, an 8% increase from the 1990 median salary of \$53,000 (Table 1). This rise does not correspond exactly to the average salary increase reported (6%), which would yield a salary slightly more than \$56,000. However, a normal margin of error would provide for a 1% to 2% swing in salaries.

One very significant change in total salaries was the amount of bonuses, overtime, or other professional income earned by respondents. The median bonus amount reported in last year's survey was \$2,000. The 1991 median bonus was reported as \$5,000, a 150% increase. Although that number may be skewed somewhat by some respondents reporting enormous bonuses, a significant increase in bonus money would be expected because of the high profits made by paper companies in the past few years. Surveys in the next few years will probably show that bonus amount declining as company profits decline.

BACKGROUND OF SURVEY. *P&P's* annual survey is based on responses to a questionnaire included in the September 1991 issue. Information from the returned forms was processed by an independent data processing firm according to *P&P's* specifications. Data from 1991 are compared with data from our 1990 and 1989 surveys to provide readers perspective on changes in compensation, benefits, and employee attitudes.

The report is designed to compare the progress of employees (specifically engineers) in the paper industry, on the supplier and consulting side as well as in primary manufacturing, with professional peers in various other

disciplines. In addition, the report also compares the salaries of specific engineering types and functions within the paper industry.

AN OVERALL PROFILE. Respondents' median income increased 8% from 1990 (Table 1). Salaries had taken a slight dip in 1989 to \$52,000 and then rose back to the 1988 level (\$53,000) in 1990. Comparing various results from those years, the small decline was attributed to retirement of some older, higher-paid respondents and the influx of younger engineers to handle the numerous capital projects going on in those years. Salaries now seem to be more on the standard track, with percentage increases from 1990 to 1991 showing a more traditional trend.

Most respondents (88%) continue to be happy with their jobs, but more are dissatisfied vs last year's survey (12% vs 10%). And the attitude of respondents continues to be negative as the industry remains in a down cycle. In 1989, 85.3% said they would stay in the paper industry if they changed jobs. Comparing 1990 and 1991 re-

TABLE 1: Salary distribution of all respondents.

	1991	1990	% Change
Lower decile	38	36	5
Lower quartile	45	43	5
Median	57	53	8
Upper quartile	70	67	4
Upper decile	84	82	2

TABLE 2: Benefits of respondents.

Benefits	% of respondents	
	1991	1990
Medical insurance	99	98
Life insurance	95	94
Retirement pension plan	86	88
401-K plan	73	NA
Dental insurance	86	85
Education allowance	50	50
Stock option plan	35	39
Profit sharing	34	38
Bonus plan	34	34
Travel budget	22	25
Company car	12	12

sults, 64% of respondents (in both surveys) said they would stay in the industry, but more said they would leave the industry (8% in 1991 vs 4% in 1990).

General job morale is also still declining. When asked to rank their morale on a scale of 1 (bad) to 5 (good), more respondents rated their morale lower than in 1990. A breakdown of the past job morale rankings shows a steady decline in the past three years:

	1991	1990	1989
One	6%	4%	7%
Two	13%	12%	13%
Three	26%	23%	No response
Four	38%	41%	50.9%
Five	17%	20%	29.1%

Some experience continues to leave the industry, according to the past three surveys, but loss seems to have slowed. In comparing the distribution of years of experience in the industry, there was about a 5% decrease in respondents with 10 to 20 years experience from the 1990 survey. The median number of years of experience dropped slightly, from 18.3 years in 1990 to 18 years in 1991.

Mechanical engineers made up the largest percentage of bachelor degrees for respondents (18%), followed by chemical engineers (16%). Business degrees dropped slightly (14% in 1991 from 16% in 1990), as did paper science and technology (13% vs 14%).

Other averages for respondents follow: the majority is male (94%), has a bachelor's degree (61%), works for a wood products/pulp and paper manufacturer (66%) in either production/mill operations (19%), engineering design (16%), engineering maintenance (13%), or technical service/quality control (12%). Possibly because of good times in the industry, job stability has improved, with 17% of respondents having changed employers in the last three years, compared with 20% in last year's survey.

Additional statistics follow:

Compensation

- There was an average of three salary increases in the past three years.
- The last pay increase for respondents was 6%.
- Eleven paid holidays and three weeks of vacation are taken yearly.
- Most salaries are reviewed annually (92%) and are based on merit/performance (52%), cost of living (5%), or both (29%).
- Eighty-two percent are not paid overtime.
- Fifty-two percent have not been promoted in the past three years, while 36% have been promoted once.

TABLE 3: Income and principal work function (all respondents).

Principal function	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% of change in median (1989-1990)
Administration	46	52	75	104	155	21
Research & development	40	49	61	72	84	2
Consulting	46	60	73	88	108	12
Engineering design/construction	39	49	62	75	88	17
Teaching/academic research ¹	28	39	58	75	85	45
Product development	35	46	53	68	80	4
Production & mill/plant operation	42	48	59	75	96	9
Engineering/maintenance	39	45	53	62	72	-
Sales and marketing	40	53	67	96	120	20
Technical service/quality control	35	41	48	60	73	7
Other	33	42	60	75	92	15

1. Limited response in this category could mean the data is not statistically significant.

TABLE 4: Income and level of supervisory management (all respondents).

Supervisory responsibility	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% of change in median (1989-1990)
None	31	39	50	59	72	11
Indirect or staff	36	44	53	66	81	10
Team or unit	39	47	56	65	77	8
Project or section	40	50	61	70	85	11
Major department or division management	49	62	76	94	115	13
Corporate management or organization	50	71	102	148	200	28

Personal

- Ninety-seven percent of respondents work full-time; 2% are self-employed.
- The average respondent works about 45 hr/week.
- Eighty-seven percent have some kind of management responsibility; the majority have indirect or staff (25%), followed by project or section (20%), major department or division (19%), or team or unit (17%).
- Twenty-five percent have advanced degrees (master's, doctorate, or MBA).
- Thirty-seven percent came from another industry.

Morale

- Twenty-one percent say their company does not listen to them or value their experience (an increase of 3% from 1989).
- A new question was asked to determine what employees felt promotions were based upon: 69% said performance/merit, 22% said politics, 14% said degree/job function, 8% said seniority, and 6% said other.

ANALYZING EFFECTS ON INCOME. Tables 1 through 5 and Figures 1 and 2 present survey findings on compensation compared with a number of variables, including principal work function, supervisory level, and region of North America. Comparing income and type of employment organization shows that consultants have the highest median income at between \$71,000 (consulting firm) and \$77,000 (self-employed consultant). Income figures in all tables, except Table 1, were obtained by adding any bonuses or additional income reported by respondents to their reported gross salaries.

Table 2 shows slight increases in the number of respondents receiving medical insurance, life insurance, and dental insurance. However, there were also significant decreases in some areas that had experienced increases in the past few years: retirement pension plan (-2%), stock option plan (-4%), profit sharing (-4%), and travel budget (-3%).

Table 3, comparing income and principal work function, shows that the highest median salary (\$75,000) belongs to those in administration. Consulting was close behind with \$73,000. Again, the small response from academia means those salaries should not be considered statistically significant.

Those at the corporate management supervisory level (Table 4) had the highest median income (\$102,000).

Table 5 compares income and the various regions surveyed. Overall, U.S. respondents make about \$5,000

TABLE 5: Income and geographic location.

Region	Lower decile	Lower quartile	Median	Upper quartile	Upper decile
U.S.	39	48	60	75	97
South	39	49	61	77	97
Northwest	42	51	60	76	92
Northeast	37	44	56	70	90
Midwest	38	45	55	70	96
Canada	35	45	55	68	85

Note: Canadian respondents were asked to convert their salaries to U.S. dollars.

more than their Canadian counterparts (Note: Canadian respondents were asked to convert their salary to U.S. dollars). In the four major U.S. regions, the South had the highest median income (\$61,000) and the Midwest had the lowest (\$55,000).

Figure 1 compares income and the type of wood/pulp/paper company for respondents. Swings in the chemical byproducts category are not statistically significant due to a small number of responses. Most of the categories posted a gain, except for R&D and wood products. As expected, for those in management positions, income increases with the number of years of management experience up to a point at around 25 years of experience, where salaries flatten out (Figure 2).

FIGURE 1: Income and type of wood/pulp/paper company (all respondents).

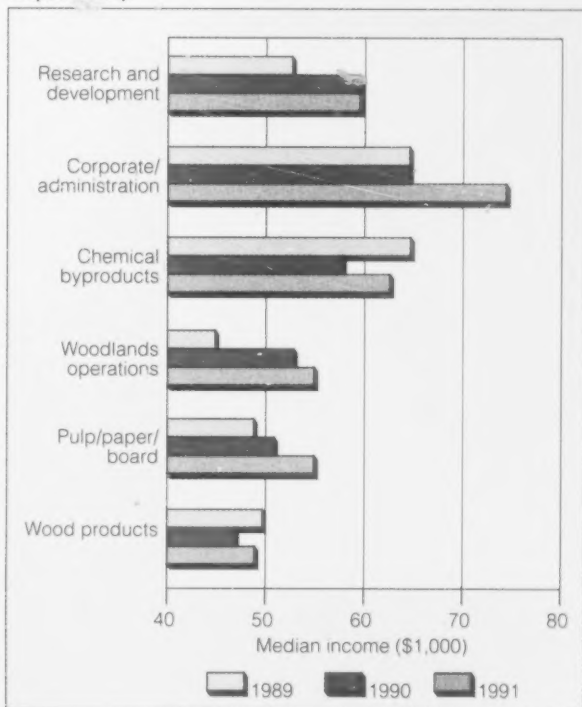
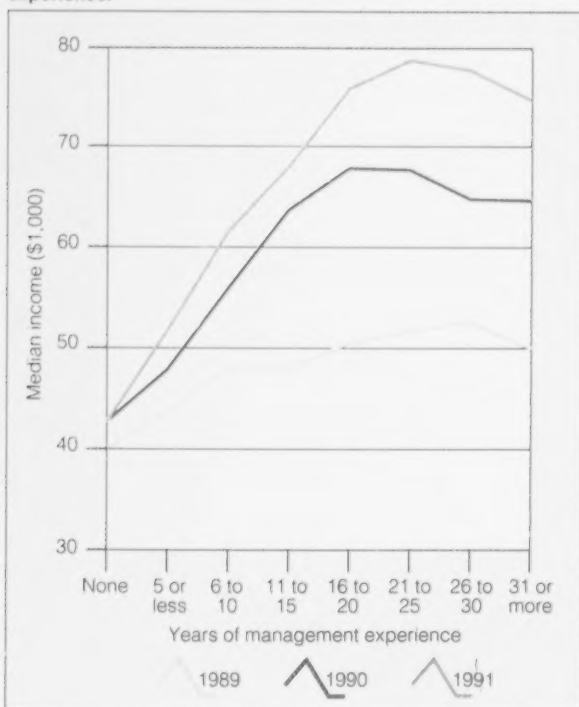
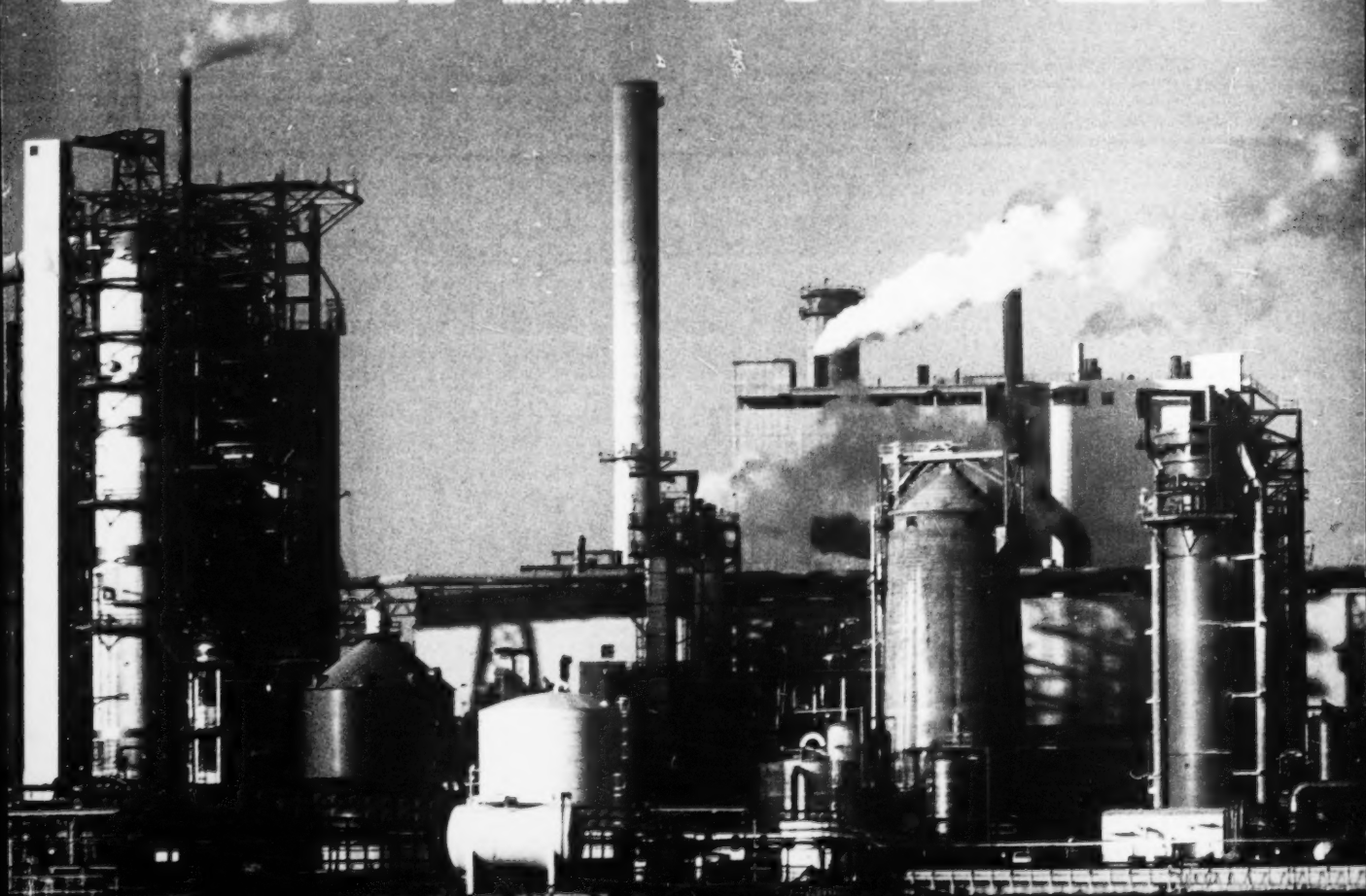


FIGURE 2: Income and number of years of management experience.



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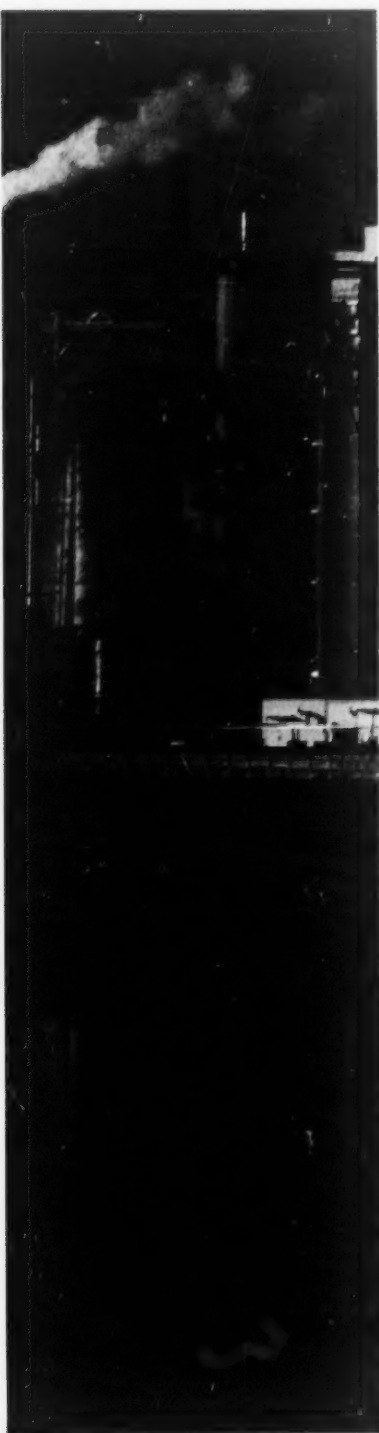
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This issue's cover story is a profile of Parsons & Whittemore's new 1,250-metric-tpd softwood kraft market pulp mill, Alabama Pine Pulp, at the company's three-mill Claiborne, Ala., complex. (Staff photo by Kelly Ferguson.)



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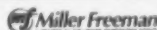
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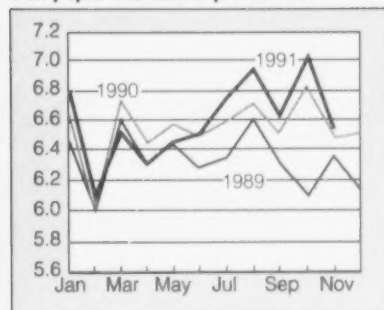
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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing offices. POSTMASTER: Please send addresses changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. **Subscriptions & Address Change:** Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean, US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48016; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. **Send subscription correspondence to:** Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.

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U.S. paper and board production



U.S. production of paper and paperboard totaled 6.5 million tons in November 1991, unchanged from the previous year, according to the American Paper Institute (API). The seasonally adjusted rate of production in November fell 1.9% below the ten-month trend. API reported, but continued well above first-half lows. Weakness was concentrated in the paper grades, which dropped 0.8% below the year-earlier pace, while paperboard continued to benefit from strong export business. Preliminary data for December pointed to total production for the year of 79.4 million tpy, a new high.

Among major grades, printing and writing shipments were off 1.3% through November, with uncoated free-sheet showing the only gain. End-use markets have weakened since the third quarter, API reported, particularly for magazine publishers. Containerboard production for export was up 20.5% to a rate of 3.1 million tpy, while boxboard targeted for export posted an 11.7% gain.

Canadian newsprint shipments totaled 686,000 metric tons in November, down 0.3% from a year earlier, while market pulp shipments rose 15.5% to 758,000 tons. Operating rates climbed to 81% at newsprint mills and 90% at pulp plants for the year through November.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Nov.	581	3.0	6,827	3.6
Uncoated groundwood (s)	Nov.	143	-5.3	1,784	-1.3
Coated paper (s)	Nov.	587	-8.6	7,346	-3.4
Uncoated free-sheet (s)	Nov.	918	-2.5	11,576	0.4
Other printing/writing	Nov.	120	-7.7	1,482	-5.7
Total packaging and other paper (s)	Nov.	361	-6.7	4,486	-2.6
Tissue	Nov.	458	-4.0	5,678	-2.1
Total paper	Nov.	3,169	-3.8	39,180	-0.8
Unbleached kraft paperboard	Nov.	1,732	2.1	20,825	2.8
Semichemical medium	Nov.	477	0.0	5,680	-0.2
Bleached paperboard	Nov.	359	6.8	4,561	3.8
Recycled paperboard	Nov.	791	9.4	9,134	1.2
Total paperboard	Nov.	3,358	3.8	40,201	2.1
Total U.S. paper and paperboard output	Nov.	6,527	0.0	79,380	0.7

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Nov.	5,249	2.5	63,718	1.4
Market pulp production	Nov.	749	11.5	8,990	2.2
Wastepaper consumption at paper/board mills	Nov.	1,862	4.7	21,864	3.7
Pulpwood consumption (cords)	Oct.	8,293	-2.6	98,724	-0.9

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Nov.	25.150	0.6	296.528*	0.1
Containerboard inventories at U.S. box plants and mills	Oct. 31	2,480	-2.7		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Oct.	1,132	-1.5	12,155	-7.5
Imports of Canadian newsprint	Oct.	648	-3.0	7,480*	-9.0
U.S. paper exports (including products)	Oct.	716	24.3	8,337	21.5
Exports of unbleached kraft linerboard	Oct.	258	27.1	3,034	14.2
Exports of woodpulp	Oct.	529	20.8	6,380	7.7
Norscan pulp inventories*	Nov. 30	1,384	-2.6		
Norscan pulp operating rates*	Nov.	90%	88%	75%	88%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Nov.	686	-0.3	7,918*	-5.0
Operating rates	Nov.	81%	79%	86%	89%
Inventories held by U.S. consumers	Nov. 30	1,248	1.2		
Other paper/board shipments	Nov.	640	1.9	6,895	0.3
Woodpulp shipments (export only)	Nov.	758	15.5	7,765	10.5
Operating rates	Nov.	90%	82%	87%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Coated free-sheet: Is 1992 the turnaround year?

Grade structure: Coated free-sheet papers contain less than 10% mechanical pulp with none in superpremium, No. 1, and No. 2 grades, and some or none in Nos. 3 and 4. Coated two-side (C2S) papers make up the bulk of coated free-sheet. C2S papers are used for magazines, catalogs, advertising brochures and inserts, and other commercial printing. Coated one-side (C1S) papers are used for labels, with some used in books, commercial printing, business forms, envelopes, and converted products other than labels. C1S represents about 12% to 13% of total coated free-sheet production. Nos. 1 and 2 generally range in basis weights from 60 lb to 100 lb, and Nos. 3 and 4 from 25 lb to 90 lb. Most coated paper (about 85%) has a glossy surface, the rest a combination of dull, matte, and embossed. Gloss finishes on the Gardner glossmeter are 45 or more for glossy, down to 25 for dull, and 20 or below for matte. Two-thirds of No. 1 is glossy, 25% dull; No. 2, 80% glossy and 16% dull; No. 3, two-thirds glossy, one-third matte, and about 3% dull. Embossed is less than 2% of any grade. No. 1 papers represented about 12% to 13% of U.S. coated free-sheet production in 1990. No. 2 was 19%, No. 3 about 28%, No. 4 about 20%, and No. 5 over 8%.

Markets: All end users reduced their demand for coated papers in 1991 because of the recession. Magazines, which used about 9% of coated free-sheet paper for cover and interior pages of upscale publications, reduced their deliveries by double-digit figures. Commercial printers (annual reports, catalogs, other advertising and promotional materials) used roughly 65% of coated free-sheet paper in 1991, book publishers used about 5%, mostly for "coffee table" books, and label converters used about 10%. Less than 1% was used for each of business forms, other converting, and export.

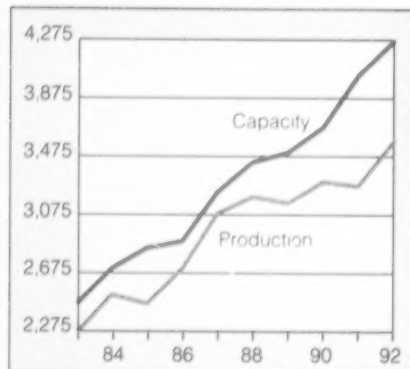
Production/capacity: Large amounts of U.S.-based coated free-sheet capac-

ity has come online in the last few years, causing significant market displacement when placed on top of the recession, which, in turn, caused declines in advertising spending, greatly affecting use of coated papers. Producers added about 355,000 tons in 1991 compared to 1990 (9.7%) and will add 5.9%, or 237,000 tpy, this year, the American Paper Institute said. Most of the tonnage entering the market in 1992 is from machines started up in 1990-91. In addition, Westvaco Corp., has not been using all of its new coating capacity, instead continuing to make more uncoated paper at Wickliffe, Ky., than originally envisioned. The only new capacity to start up in 1992 is a 212,000-tpy machine at Consolidated Papers Inc. in Wisconsin Rapids, Wis. Canadian coated free-sheet producers will raise capacity about 24% this year to 155,000 metric tpy, after an 8.7% increase in 1991, the Canadian Pulp & Paper Assn. reported. However, this total tonnage remains small compared to the U.S. and could drop if Abitibi-Price Inc. closes its Provincial Papers unit in Thunder Bay, Ont.

Outlook: No. 1 growth will be about 12%/year through 1998. No. 2 will increase coated market share to nearly 5%. No. 3 will grow 5.7% annually. Demand for No. 4 free-sheet will increase faster than for No. 4 groundwood. Nos. 1, 2, and 3 grades will experience strong growth. European producers have also entered the market; they currently supply about 8% of total U.S. demand for Nos. 1, 2, and the superpremium grades.

Prices: Historical pricing trends (dollars/short ton, average price for year, except year-end 1991) for coated free-sheet are as follows for 70-lb No. 1 sheets: 1986, \$1,350; 1987, \$1,410; 1988, \$1,509; 1989, \$1,614; 1990, \$1,610; 1991, \$1,540. The following are historical prices for No. 3 rolls: 1986, \$945; 1987, \$980; 1988, \$1,115; 1989, \$1,258; 1990, \$1,270; 1991, \$1,000-1,080.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1990 ¹	1991e	1992e
Production ¹	3,303	3,274	3,579
Capacity ¹	3,676	4,031	4,268
Utilization rate	89.9%	81.2%	83.9%
Imports	276	288	307
Exports	77	85	110
Apparent U.S. consumption	3,502	3,477	3,776
lb/capita	28.02	27.53	29.67
GDP ratio ⁴	0.84	0.83	0.90

e = Estimate. 1. Revised. 2. Pulp & Paper estimates.
3. API. 4. 000 tons/\$billion real GDP (1982).

TOP NORTH AMERICAN PRODUCERS

Company	Annual capacity (000 tons)	Market share (%)
1. Scott Paper ¹	1,100	24.8%
2. Westvaco ²	590	13.3%
3. Champion International	510	11.5%
4. Simpson Paper ¹	450	10.1%
5. Mead	382	8.6%
6. Consolidated Papers ¹	380	8.6%
7. Repap Enterprises	334	7.5%
8. Potlatch	310	7.0%
9. Noranda Forest	170	3.8%
10. Abitibi-Price ⁴	100	2.3%
11. Boise Cascade	100	2.3%
12. Stora Papyrus Newton Falls	100	2.3%

North American capacity (1992):

4,439 million tons

Canada

171,000 short tpy

Capacity share of top five companies:

66.3%

Capacity share of top ten companies:

97.5%

e = Estimate. 1. S.D. Warren Div. 2. Pulp & Paper estimates.
3. Some potential coated capacity is unused.
4. Provincial Papers currently has two machines operating.

SALES AND EARNINGS

U.S. industry closes books on difficult year

U.S. forest products companies ended 1991 with another set of dreary bottom-line performances as a Pulp & Paper Week survey of 24 pulp and paper manufacturers showed fourth-quarter sales of \$20.5 billion, down 2.6% compared with the same period a year earlier. Earnings (excluding major nonrecurring items) came in at \$394 million, off 49.2% from year-ago figures and down 23.7% from third-quarter profits. Including nonrecurring items, fourth-quarter net income came in at a deficit of \$78 million compared with a profit of \$188 million in the same quarter a year earlier.

Soft demand and low pricing continued to be at the root of most of the industry's woes. Looking forward, some producers, particularly in containerboard and wood products, are voicing optimism that better times may lie ahead, while others, especially in newsprint and coated papers, see faint hope for a near-term turnaround.

For the full year, the aggregate of the 24 companies surveyed showed sales down 4.1% and adjusted profits off 53.4% to just under \$2 billion. Including all nonrecurring items, earnings fell by 66.9% to \$1.2 billion from \$3.6 billion.

While industry giants International Paper Co., Georgia-Pacific Corp., and Weyerhaeuser Co. have been enjoying a smart run-up in their share prices, earnings have yet to follow suit. Excluding special items, IP netted about \$103 million in the fourth quarter, down 35.6% from fourth-quarter 1990, and 5.5% from third-quarter 1991. For the full year, adjusted profits were off by 38.2%. The company also took special charges to cover previously announced severance costs (\$37 million) and adoption of new accounting standard, SFAS 106, relating to postretirement employee medical and life insurance benefits.

Georgia-Pacific reported a fourth-quarter net loss of \$50 million compared with the \$34-million adjusted profit a year earlier. The fourth quarter 1991 tally excludes a \$27-million gain on the sale of Great Northern Paper Inc. to Bowater Inc. and a \$44-million after-tax charge related to the accelerated write-down of capitalized debt issue costs. Principally responsi-

ble for the poor results was an 81% decline, to \$49 million, in operating profits for G-P's pulp and paper businesses due to continued weak pricing for most grades. On the other hand, G-P's building products division performed better than expected in the fourth quarter with operating profits doubling from year-ago levels to \$77 million; moreover, prices are reportedly improving as the home construction season approaches.

Dismal pulp and paper earnings overshadowed improved profitability at its wood products business as Weyerhaeuser posted adjusted earnings of \$26 million in the fourth quarter. For the full year, profits were off 54% to \$182 million. This 1991 earnings figure excludes a \$344-million special items net charge.

Whitepaper mills reeling. It was rough going at Boise Cascade Corp. in 1991, with the company posting the

U.S. paper and forest products company sales and earnings.

Company	Full year 1991 (\$000)			
	Sales 1991	% change 1991/90	Earnings 1991 ¹	% change 1991/90
Boise Cascade Corp.	\$ 3,980,490	-5.6%	\$ (142,383)	NM
Bowater Inc.	1,288,517	-6.7	45,589	-47.8%
Champion International Corp.	4,786,403	-6.0	14,417	-94.1
Chesapeake Corp.	840,490	-0.1	15,365	-8.2
Consolidated Papers Inc.	871,864	-8.1	91,445	-35.8
Federal Paperboard Co., Inc. ²	1,435,000	4.4	89,700	-30.6
Georgia-Pacific Corp.	11,524,000	-8.9	(122,000)	NM
International Paper Co. ³	12,703,000	-2.0	436,000	-38.2
James River Corp. ⁴	4,581,726	-15.8	78,291	-66.4
Kimberly-Clark Corp.	6,776,900	5.8	488,300	2.6
Longview Fibre (10/31) Co.	844,000	-8.1	16,843	-72.8
Louisiana-Pacific Corp.	1,702,100	-5.1	55,900	-38.6
Meed Corp. ⁵	4,579,300	-4.0	70,800	-58.1
Mosinee Paper Corp.	197,424	-8.2	902	-92.5
Pentain Inc.	1,169,082	-0.6	41,100	24.5
Pope & Talbot Inc.	502,275	-10.7	(2,995)	NM
Pottlatch Corp.	1,236,988	-1.3	65,802	-43.4
Scott Paper Co. ⁶	4,976,500	-7.1	113,100	-54.4
Sonoco Products Co.	1,657,058	1.7	90,305	-14.1
Union Camp Corp.	2,967,136	4.5	124,790	-45.6
Wausau Paper Mills Co. (8/31)	350,361	3.1	30,475	118.7
Westvaco Corp. (10/31)	2,301,204	-4.5	163,122	-18.7
Weyerhaeuser Paper Co. ⁷	8,701,598	-3.6	182,052	-53.8
Willamette Industries Inc.	2,004,501	5.2	45,809	-64.6
Total	\$21,787,919	-4.1%	\$1,972,630	-53.4%

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years. 2. Federal Paperboard Fourth quarter is a 16-week period. 1990 sales have been restated. 3. International Paper 1991 earnings exclude nonrecurring charges totaling \$262 million including \$37 million booked in the fourth quarter. 1990 earnings exclude \$137 million in nonrecurring charges, all booked in the fourth quarter. 4. James River Fourth-quarter 1990 was 14 weeks vs the normal 13 weeks in 1991. 1990 earnings exclude \$155 million in net nonrecurring charges. 5. Meed 1991 earnings exclude nonrecurring and discontinued items netting \$63.9 million, including \$5.2 million booked in the fourth quarter. 1990 earnings exclude \$122.9 million in special charges. 6. Scott Paper 1991 earnings exclude nonrecurring charges of \$183 million, all of which were booked in the fourth quarter. 1990 earnings exclude \$100 million in nonrecurring charges. 7. Weyerhaeuser 1991 earnings exclude nonrecurring charges of \$344 million including \$283 million booked in the fourth quarter. NM=not meaningful.

industry's largest deficit, excluding special items, at \$142 million. During the year, Boise's product lines, heavily oriented to printing/writing papers, newsprint, and market pulp, have been hard hit by weak demand and declining prices. In addition, four of Boise's ten mills are located in the Pacific Northwest and are consequently vulnerable to rising wood costs. Unfavorable exchange rates exacerbated the suffering of two units in Canada. One positive development for Boise has been a surge in profitability for its building products segment due to higher prices for logs, lumber, and plywood. This business should maintain its momentum in 1992, but even so, the company's overall prospects, especially early in the year, are dim.

Despite reportedly significant productivity gains, Champion International Corp., which produces many of the same products as Boise, has been another company in distress. Champion posted a small loss in the fourth quarter, and for the full year, profits, excluding special items, came in at about \$14 million, making 1991 the company's least profitable year since it was formed in a merger 25 years ago.

Depressed printing and writing papers profits were at the center of Mead Corp.'s disappointing earnings performance. Excluding an assortment of special items, including write-downs, asset sales (Micromedix), discontinued operations (Mead's reinsurance business), and accounting charges, Mead's profit was \$13.4 million, down 13.5%, for the fourth quarter, and \$70.8 million, down 56.1%, for the full year. Not all the news was bad, however, as the company's paperboard/packaging and electronic publishing operations experienced healthy increases in profits. The paperboard business was buoyed by expanded production and higher prices for coated natural kraft.

In newsprint, Bowater's bottom line is testament to just how far pricing has fallen. Considered one of the lowest-cost producers in North America, Bowater's newsprint operations reported a \$6 million operating loss in the fourth quarter. More serious blood baths are expected among the Canadian producers, but with profits almost as severely crimped at its other operations, Bowater, with the help of an end-of-the-year tax adjustment, barely scraped a profit in 1991.

Kimberly-Clark Corp. continues to

benefit from low pulp costs and apparent market share gains driven by aggressive promotion of its "new or improved consumer products." In all, K-C turned in an unexpectedly strong fourth quarter to finish 1991 with a 2.6% full-year profit advance, beating out IP for the title of the paper industry's highest earner. Rival James River Corp., on the other hand, netted

\$7.8 million in the fourth quarter reflecting "adverse competitive conditions and a recessionary economy." Scott Paper Co. has also been struggling and chose to broaden and accelerate a business improvement program initiated in 1990. Excluding restructuring charges, Scott reported earnings of \$25 million, down 48%, for the fourth quarter. ■

MARKET PULP

Weyco's Everett mill succumbs

Weyerhaeuser Co. announced that it will shut down its Everett, Wash., pulp mill permanently, effective Mar. 29, and added that it might close more facilities as part of an ongoing reorganization after taking a \$344-million hit at year-end 1991. The company said last October that it would close its Klamath Falls, Ore., lumber mill in mid-1992, and there will "probably be several more" closures, according to Mike Walters, director of external communications. But he declined to identify possible targets.

Everett produces 385 metric tpd of bleached kraft market pulp, primarily fluff, though some paper-grade pulp is also produced. The pulp is used in disposable diapers, feminine sanitary products, backing for sandpaper, and printing and writing paper. Pulp Div. vice president Carl Geist said the Everett mill was a victim of "difficult market conditions, including overcapacity and severe pulp price attrition,

escalating raw material costs, and the capital investment required to comply with current environmental regulations." Geist said the mill depends on nonWeyerhaeuser sawmills for three-quarters of its chip supply, making it vulnerable to escalating chip prices resulting from harvesting restrictions to protect the northern spotted owl and other environmental factors. And to get the mill up to current environmental standards would have cost \$35 to \$40 million over the next three years, he estimated.

Referring to Everett as "a small, outdated mill in a market with substantial overcapacity," Geist said the facility "posted a substantial loss in 1991" (public relations manager Bruce Crabtree marked it at "several million dollars"). Similar losses were projected for the next several years. Weyco said it will give job search support and termination benefits to the 285 employees who will be laid off. ■

Georgia-Pacific paces new price hikes

Market pulp producers were gaining confidence early last month as order books firmed up and inventories apparently continued to decline. With prices rising over the last few months, Georgia-Pacific Corp.'s enthusiasm for the market prompted it to announce further increases. For export markets, G-P said that it will seek a hike of \$40/metric ton on northern and southern hardwood, southern pine, and softwood sulfite and \$25/ton on fluff, effective Mar. 1. Prices in North American markets will be raised \$40/ton on southern pine and southern mixed hardwood pulp and \$50/ton on northern hardwood pulp, effective Apr. 1. Rumors abound that other producers will raise some prices, but this could not be confirmed. Some

suppliers said they would wait to determine their pricing policy.

The hike in March will bring G-P's exports to \$530/ton for southern mixed hardwood, \$535 for northern hardwood, \$540 for southern pine and softwood sulfite, and \$650 for fluff. In April, North American prices for southern pine will rise to \$525/ton, southern mixed hardwood to \$500, and northern hardwood to \$510.

Canadian producers had said they would bump northern bleached softwood kraft (NBSK) up \$20 to \$540/ton on Feb. 1 in major world markets. They may push the envelope further with another hike as improvements in other grades buoy northern softwood. In Europe, the local currency prices are edging up as well. ■

probably haven't made our position clear," said Rolland president Roger Ashby. "We'll go back until we have made our position clear. We don't take no for an answer."

"We've done our part." The CPU is apparently reticent on the amount of concessions paperworkers are being expected to accept and is already active in negotiating with government and industry officials in solving some of the fundamental problems facing the forest products sector. The 69,000-member CPU is exploring a proposed merger with the Communication & Electrical Workers Union, with 40,000 members, and the Energy & Chemical Workers Union, with 35,000 members across Canada. The unions have set up a committee to examine a possible merger aimed at trimming overhead costs and increasing bargaining and organizing muscle. Strikes could be much more effective in a larger union where members in other industries continued to work and pay dues.

With competitors in Sweden and Finland, that have high labor costs similar to Canada, seeking wage rollbacks, some observers expect not only wage freezes in eastern Canada but an actual wage concession for British Columbia workers in upcoming labor talks.

"It ain't gonna happen." CPU vice president Norm MacLellan told the *Vancouver Sun*. "There will be no wage rollbacks. We took a ten-month extension; in other words, we said for ten months we would keep operating your plants at no added cost. We've done our part."

"The problems in the industry have nothing to do with the high cost of production of pulp," MacLellan continued. "It's more to do with the artificially high Canadian dollar and interest rates which cause all kinds of problems." Observers also blame problems within newsprint markets on the failure of Canadian producers to effectively limit discounts and respond decisively to the problems of overcapacity and recycled-content requirements by U.S. customers.

"If wages were the industry's ills, we'd be stupid not to renegotiate," said CPU spokesman Serge Lord. "But that's obviously not the problem. We have a contract in hand, and we fully intend on making sure it's respected. When the companies were making billions in the '80s, we didn't ask to reopen signed contracts." ■

Bargaining in 1992 may see longer pacts

A trend toward more long-term labor agreements may again become a factor in U.S. paper industry bargaining as new five-year labor contracts were established at International Paper Co.'s Gardiner, Ore., mill, Scott Paper Co.'s Mobile, Ala., mill, and at P.H. Glatfelter Co.'s Ecusta Div. mill in Pisgah Forest, N.C. Meanwhile, Georgia-Pacific Corp. implemented contract conditions with United Paperworkers International Union (UPIU) locals at its Port Edwards and Nekoosa, Wis., mills and had a five-year contract offer rejected at Monticello, Miss., perhaps also indicating some difficult negotiations ahead for the U.S. industry as an economic recession continues to hurt business. G-P also began talks with the Assn. of Western Pulp & Paperworkers (AWPPW) at its Toledo, Ore., linerboard mill, which suffered a strike in 1990.

More than 26,300 workers will be involved in labor contract negotiations in the U.S. paper industry in 1992 as agreements expire at 62 mill locations throughout the country, the American Paper Institute (API) reported. Five-year agreements, which made up 29% of the 73 agreements reached in 1990, made up 19% of the 41 contracts reached as of Nov. 1, 1991, API reported. Approximately 51% of contract settlements reached in 1990 were for four or more years, down from 58% in 1990 but well above the 10% recorded in 1987, API said.

Meanwhile, a steady rate of employment along with a flat trend of paper and paperboard production since 1988 has caused productivity level gains for U.S. paper and allied product workers to decline from a 7.5% increase in output per employee in 1986 to 0.4% in 1989. Although figures for last year are currently not available, API said it projects a 1.7% gain in output per employee hour in 1990 from 1989 but a smaller increase for 1991. These gains are well below the longer-term productivity increases of 3.7% annually from 1947 to 1989. The January 1991 index of output per employee hour was 3.0% above its 1988 level, API reported. Strikes have declined significantly in recent years, from a peak in the last decade of 19 strikes in 1983 to nine in 1987, two in 1990, and three strikes in 1991, records show.

Higher wage increases. Wage in-

creases in the IP, Scott Paper, and Glatfelter contract settlements surpass last year's first-year average increase, with Scott offering an average of about 2.75% each year at Mobile, while Glatfelter offered wage increases of 2.5% in the first year, 2.75% in the second and third, and 3.0% in the fourth and fifth years. IP will hike wages 2.5% at Gardiner every ten months through 1996, the company said. API estimated that first-year wage increases in the U.S. pulp and paper industry averaged 2.2% in 1991, 2.5% in 1990, and 1.2% in 1989.

Average hourly compensation for paper industry production workers rose 2.4% from 1985 to 1989, compared to a 7.6% annual increase seen for the 1979-85 period, statistics from the Bureau of Labor show.

The new contract with more than 1,000 workers at Glatfelter's Ecusta Div. was reached after more than five months of negotiations. UPIU Local 1971 at Pisgah Forest had given Glatfelter a five-day strike notice Jan. 18 before ratifying the company's last offer by 58%. The contract provides for a number of increases in employee benefits consistent with other white-papers mills in the southern U.S., Glatfelter said.

Scott Paper's agreement, covering 2,435 members of four UPIU locals, was reached five months earlier than the current contract's expiration date. Members of UPIU locals 423, 1421, 1575, and 1873 ratified Scott Paper's contract offer by 86% at the giant tissue, fine papers, and pulp mill. The company increased pensions, lifted wages, and raised the cap on company-paid health insurance. UPIU said an "excellent labor/management cooperation pact" between Scott and the union paved the way for the Mobile agreement.

IP settled with 214 members of Local 101 of the Assn. of Western Pulp & Paper Workers at Gardiner on Jan. 30. The old contract expired in March 1991. "The five year agreement benefits the company and employees alike in terms of stability, security, and the ability to plan for the future over a longer period of time," said Gardiner mill manager Ed Locke.

Bad blood. In the meantime, 1,200 union workers at the Georgia-Pacific mills in Port Edwards and Nekoosa continued to work as the company

implemented the contract conditions with UPIU locals 52 and 59. Workers at the two locations rejected G-P's offer Nov. 8 after working under an expired contract since May 31. UPIU said it filed a complaint against the company, accusing it of unfair labor practices.

At Monticello, Miss., UPIU Locals 371 and 1369 unanimously rejected a five-year contract offer by G-P, which acquired the linerboard mill from St. Regis in 1985. The previous contract expired Oct. 1. A three-year agreement was reached at G-P's Big Island, Va., linerboard mill, increasing wages 2.5% each year.

Contract negotiations began in December between AWPPW Local 13 and Georgia-Pacific at the company's Toledo mill. The current contract expired Jan. 1, 1992, with key issues on the agenda including healthcare cost sharing, work-rule flexibility, and Sunday premium pay, G-P said. The 400 members of Local 13 struck the mill for more than two months in a dispute over contract concessions demanded by the company.

G-P has proposed that the new contract include a provision for employees to share a portion of healthcare costs for dependents while G-P would continue to pay the full premium for employee healthcare insurance. The flexibility proposal would remove limiting work rules of the contract allowing for better application of employees' skills, experience, and knowledge on the job, G-P said. The company added that eliminating Sunday premium pay would help put the Toledo mill on an equal footing with competitors.

"Hard work alone won't do it," said Ed Babin, senior vice president of G-P's Containerboard and Packaging Div. "We have to lower our costs through a number of changes in how we operate."

NEWSPRINT

CP Forest to shut mill and idle machines

Canadian Pacific (CP) Forest Products Ltd., hit by "the severe economic conditions prevailing in the pulp and paper industry," said in January that it will close its groundwood specialties mill in Trois-Rivières, Que., and shut down two of the four newsprint machines at Dalhousie, N.B., later this year. CP Forest also said it will take a

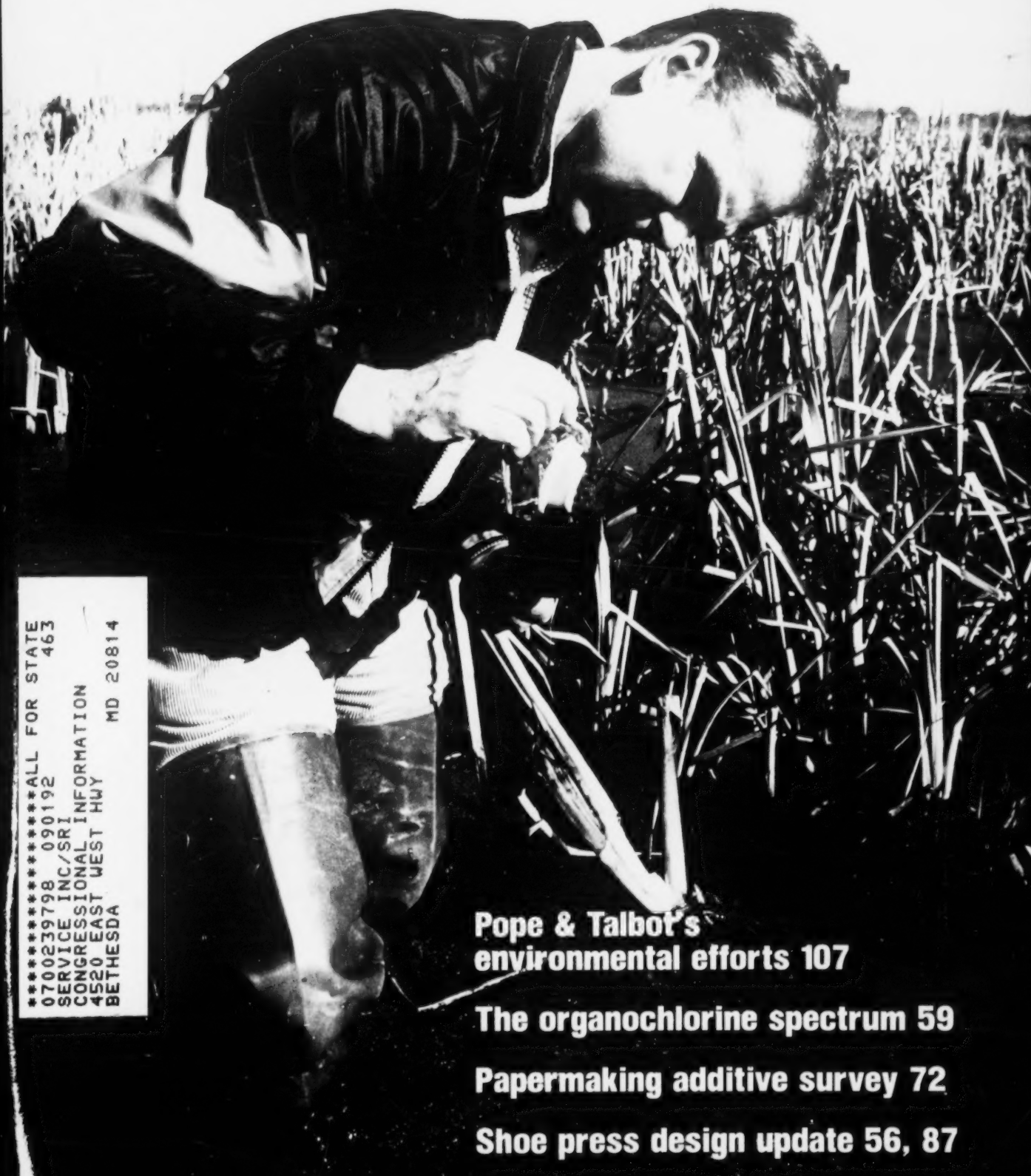
Labor bargaining calendar 1992, U.S. pulp, paper, and board mills.

Company, mill	Union	No. of employees	Contract expires
Southern Region			
International Paper Co., Bastrop, LA	U,E	873	1/31
Rock-Tenn Co., Dallas, TX	U	154	1/31
Procter & Gamble Co., Perry, FL	U	749	3/14
International Paper Co., Moss-Point, MS	U,E	859	3/31
Georgia-Pacific Corp., Palatka, FL	U,E,O	1,074	5/31
International Paper Co., Georgetown, SC	U,E,O	678	5/31
Jefferson Smurfit/CCA Corp., Fernandina, FL	U,E,O	460	5/31
Scott Paper Co., Mobile, AL	U,E,O	2,450	5/31
Stone Savannah River Corp., Port Wentworth, GA	U,E,O	321	6/19
Westvaco Corp., Wickliffe, KY	U	349	6/30
Weyerhaeuser Paper Co., Plymouth, NC	U,E,O	1,257	7/31
Georgia-Pacific Corp., Pryor, OK	U	116	8/15
Macon Kraft Co., Macon, GA	U,E,O	386	8/27
Stone Container Corp., Florence, SC	U	461	8/31
Federal Paper Board Co. Inc., Riegelwood, NC	U	1,172	9/8
Kimberly-Clark Corp., Coosa Pines, AL	U	—	9/14
MacMillan Bloedel Inc., Pine Hill, AL	U	396	10/4
Sonoco Products Co., Richmond, VA	U	62	11/30
Westvaco Corp., Covington, VA	U,E	997	11/30
Westvaco Corp., Luke, MD	U,E	1,209	11/30
Weyerhaeuser Paper Co., New Bern, NC	U	396	12/19
New England/Eastern Region			
Simpson Paper Co., Miquon, PA	U	205	2/14
Yorktowne Paper Mills, Inc., N. Hoosick, NY	U	60	3/1
Hollingsworth & Vose Co., Greenwich, NY	U	64	3/1
American Tissue Mills of MA, Inc., Baldwinville, MA	U	58	4/30
James River Corp., Fitchburg, MA	U	87	4/30
Madison Paper Industries, Madison, ME	U	224	4/30
James River Corp., Milford, NJ	U,E	322	5/31
Specialty Coatings Group Inc., Hughesville, NJ	U,E	210	5/31
Mohawk Paper Mills Inc., Cohoes, Waterford, NY	U	191	5/31
Jefferson Smurfit Corp., Philadelphia, PA	U,E,O	210	6/19
Scott Paper Co., Westbrook, ME	U,E,O	1,259	6/1
Erving Paper Mills, Erving, MA	U	360	7/31
Rising Paper Co., Housatonic, MA	U	134	7/31
PCA Plattsburgh, NY	U	180	8/1
Georgia-Pacific Corp., Plattsburgh, NY	U	395	9/30
Yorktowne Paper Mills, Inc., York, PA	U	83	10/1
Rock-Tenn Co., Stroudsburg, PA	U	79	10/12
Fraser Paper Ltd., Madawaska, ME	U,O	947	11/1
Midwest Region			
Crystal Tissue Co., Middletown, OH	U	120	1/1
Georgia-Pacific Corp., Gary IN	U	52	3/31
James River Corp., Ypsilanti, MI	O	78	4/1
Detroit River Paper, Detroit, MI	U	195	4/30
Georgia-Pacific Corp., Kalamazoo, MI	O	268	4/30
Menominee Paper Co., Inc., Menominee, MI	U	305	4/30
Cincinnati Paperboard Corp., Cincinnati, OH	U	78	6/19
Jefferson Smurfit/CCA Corp., Carthage, IN	U,O	353	6/19
Circleville, OH, Wabash, IN			
Fletcher Paper Co., Alpena, MI	U	142	6/30
Wisconsin Tissue Mills, Menasha, WI	U	917	6/30
Weyerhaeuser Paper Co., Rothschild, WI	U	385	7/1
P.H. Glatfelter Co., Neenah, WI	U	328	8.1
International Paper Co., Hamilton, OH	U	370	9.28
Pacific Coast Region			
Georgia-Pacific Corp., Toledo, OR	W	405	1/1
ITT Rayonier Inc., Hoquiam, WA	W	216	3/16
James River Corp., Camas, WA	W	1,608	6/1
Ketchikan Pulp Co., Ketchikan, AK	W,E,O	348	6/1
Inland Container Corp., Newark, CA	U	50	7/1
Newark Pacific Paperboard Corp., Los Angeles, CA	U	66	8/10
Simpson Tacoma Kraft Co., Tacoma, WA	U	496	9/1

Legend: U=United Paperworker International Union; W=Assn. of Western Pulp & Paper Workers; E=International Brotherhood of Electrical Workers; O=others. Source: American Paper Institute.

PULP & PAPER

April 1992



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This issue's environmental focus includes a report (p. 107) on Pope & Talbot's efforts along with Oregon's environmental protection division to meet regulatory requirements. In the cover photo, Pope & Talbot's environmental manager Roger Sherwood examines cattail roots at the Halsey, Ore., mill's experimental wetlands/wastewater treatment facility. (Photo courtesy of Pope & Talbot).

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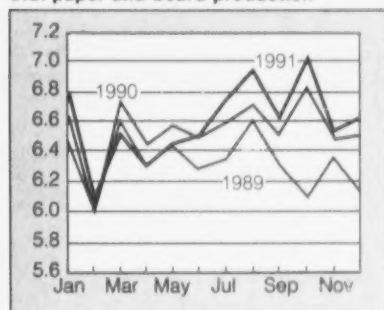
PULP & PAPER (ISSN 0033-4081) [Canadian GST permit number 124513185], with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. **Subscriptions & Address Change:** Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean, US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. **Send subscription correspondence to:** Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.



A United Newspapers publication



U.S. paper and board production



U.S. production of paper and paperboard totaled 6.6 million tons in December 1991, up 1.5% from the previous year, according to the American Paper Institute. The increase brought total production for the year to a new high of 79.4 million tons, up 0.8% from 1990. Paper production was off 0.7% from 1990 to 39.1 million tons, as increased output in the middle of the year was not enough to offset a shortfall of 1.4% in the first half and a sharp dropoff in November and December. Paperboard continued to strengthen as the year progressed, ending the year up 2.3% to a record 40.3 million tons.

Among major grades, only newsprint posted a gain for the year in the paper sector. Printing and writing shipments dropped 1.2% to 22.1 million tons, despite a 7.7% increase in office reprographics demand. Book and magazine publishers reduced receipts about 11%, while commercial printing held even. Unbleached kraft paperboard production for the export market rose 21.1% in 1991, while containerboard production for the domestic market grew 0.8%.

Canadian newsprint shipments totaled 713,000 metric tpy in December, down 3.6% from a year earlier. Woodpulp shipments climbed 28.9% to 851,000 tons. Newsprint production for the year declined 1.0% to 9.0 million tons, while pulp output rose 2.0% to 23.2 million tons.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Dec.	582	1.0	6,841	3.5
Uncoated groundwood (s)	Dec.	140	-4.8	1,775	-1.7
Coated paper (s)	Dec.	566	0.4	7,310	-3.0
Uncoated free-sheet (s)	Dec.	929	-0.1	11,552	0.4
Other printing/writing	Dec.	107	-11.6	1,463	-7.6
Total packaging and other paper (s)	Dec.	357	0.0	4,469	-2.3
Tissue	Dec.	464	-4.1	5,669	-2.3
Total paper	Dec.	3,145	-1.1	39,078	-0.7
Unbleached kraft paperboard	Dec.	1,860	3.6	20,949	2.9
Semichemical medium	Dec.	506	2.4	5,713	0.1
Bleached paperboard	Dec.	374	1.1	4,556	3.6
Recycled paperboard	Dec.	733	7.8	9,105	1.7
Total paperboard	Dec.	3,474	4.0	40,323	2.3
Total U.S. paper and paperboard output	Dec.	6,619	1.5	79,401	0.8

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Dec.	5,472	0.8	63,818	1.2
Market pulp production	Dec.	823	11.7	9,045	2.8
Wastepaper consumption at paper/board mills	Dec.	1,883	9.7	22,733	8.4
Pulpwood consumption (cords)	Nov.	7,966	-1.9	98,439	-0.9

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ³)	Dec.	23,453	8.7	319,998*	0.6
Containerboard inventories at U.S. box plants and mills	Nov. 30	2,487	-1.9		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Dec.	1,007	-5.9	12,149	-7.3
Imports of Canadian newsprint	Dec.	583	-11.4	7,436*	-9.2
U.S. paper exports (including products)	Dec.	663	21.4	8,302	21.5
Exports of unbleached kraft linerboard	Dec.	240	37.9	3,020	16.0
Exports of woodpulp	Dec.	476	-0.2	6,238	5.6
Norscan pulp inventories*	Dec. 31	1,232	-9.3		
Norscan pulp operating rates*	Dec.	85%	91%	88%	86%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Dec.	713	-3.6	8,756*	-3.5
Operating rates	Dec.	74%	83%	87%	89%
Inventories held by U.S. consumers	Dec. 31	1,234	-0.6		
Other paper/board shipments	Dec.	551	2.4	7,536	1.0
Woodpulp shipments (export only)	Dec.	851	28.9	8,617	12.1
Operating rates	Dec.	74%	78%	86%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Uncoated free-sheet: 1992 may rally, but oversupply persists

Grade structure: Chemical pulps (sulfate, sulfite, soda, cotton linters, or vegetable fiber) are used to make uncoated papers, with occasional additions of up to 10% mechanical fiber, with some mills using bleached chemi-thermomechanical pulps (BCTMP) and recycled fibers. BCTMP furnishes lower the cost of manufacture while providing a better grade of paper than stone groundwood or other mechanical pulps. Many of the major producers have converted some or all of their machines to alkaline-based paper, and most new installations are alkaline.

Uncoated free-sheet papers are used for publishing, commercial printing, office/business, and writing. A smaller subgrouping includes products such as cigarette papers and carbonizing tissue, and there are various converting substrates.

Printing offset and office reprographic papers each represent about one-quarter of uncoated free-sheet production in the U.S. The rise in office reprographics is increasing the share of cut-size bond papers for such uses as computer page (laser) printers and photocopiers. Form bond has been losing ground to cut-size bond, dropping to about 19% of 1991 production of uncoated free-sheet papers. Envelope grades represented just over 10%, tablet was under 4%, text and cover grades were slightly over 3%. Miscellaneous printing/writing papers made up the balance.

Production/capacity: Most U.S. uncoated free-sheet capacity growth in recent years has been in the South, with the exception of a very large machine in the upper Midwest, after developing its base in the Northeast and Midwest. Domtar Inc. and Canadian Pacific Forest products Ltd. have been leaders in increasing Canadian uncoated free-sheet capacity.

U.S. uncoated free-sheet paper ca-

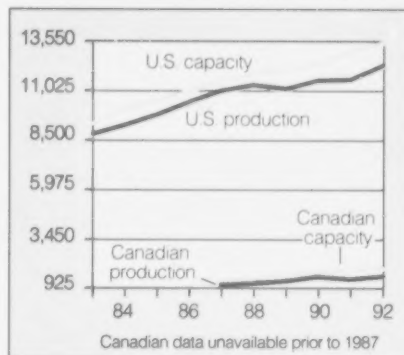
capacity is forecast to advance 3.9% to almost 13.5 million tons in 1992, according to the American Paper Institute. Canadian capacity will grow by 3.9% to 1.7 million short tons, the Canadian Pulp & Paper Assn. projects.

Some tonnage remains to come online from 1991 startups, but only a relatively small machine at Kimberly-Clark Corp.'s Neenah Paper Div. mill in Whiting, Wis., is due online in 1992. Projects over 1993-94 include Champion International Corp., Courtland, Ala., 240,000 tpy; Willamette Industries' Penntech Papers, Johnsonburg, Pa., 210,000 tpy; and Appleton Papers, Combined Locks, Wis., 75,000 to 80,000 tpy. International Paper Co. will probably add a second machine at Selma, Ala., in 1994-95. Boise Cascade Corp., may phase out 22,000 tpy of uncoated free-sheet production at St. Helens, Ore.

Outlook: Operating rates dipped to 89% to 90% for U.S. mills in 1991, down from 93.3% in 1990. Economic rebound and absorption of new capacity will boost utilization to 91% to 92% this year, if the economy is strong, but not until the second half. Inventory rebuilding may begin, spurred in part by price increases announced for February and March. But most customers are wary of carrying excess, overpriced inventories after the difficult 1990-91 period, and an uncertain business climate.

Pricing: Prices suffered drastic discounts in 1991, and three price hikes in quick succession toward the end of 1991 essentially failed. Price trends for two important grades are (year-end, \$/short ton): book paper, No. 3 offset, 45-lb sheets: 1987, \$850; 1988, \$1,020; 1989, \$940; 1990, \$1,020; 1991, \$940. Bond, No. 4, reprographic, 20-lb, 83-bright: 1987, \$820; 1988, \$960; 1989, \$920; 1990, \$960; 1991, \$680-700. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990	1991	1992e
Production ¹	11,503	11,552	12,271
Capacity	12,335	12,981	13,482
Utilization rate	93.3%	89.0%	91.0%
Imports	752	679	810
Exports	232	358	372
Apparent U.S. consumption	12,023	11,873	12,709
lb/capita ²	96.19	93.99	99.87
GDP ratio (1982)	2.89	2.84	2.87
Canada			
Production ¹	1,359	1,242	1,390
Capacity ¹	1,574	1,651	1,716
Utilization rate	86.3%	75.2%	81.0%
Exports ^{3,4}	662	616	690
Consumption ¹	697	626	700

e = Estimate. 1. API. 2. Revised. 3. CPPA.

4. More than 90% is shipped to U.S.

TOP NORTH AMERICAN PRODUCERS

Company	Annual capacity (000 tons)	Market share (%)
1. International Paper	2,250	14.8%
2. Georgia-Pacific/GNN	2,240	14.7%
3. Champion International	1,226	8.1%
4. Boise Cascade	1,180	7.8%
5. Union Camp	1,100	7.2%
6. Weyerhaeuser	799	5.3%
7. James River	730	4.8%
8. Domtar	650	4.3%
9. Willamette	600	3.9%
10. Mead	550	3.6%

Market share of top five companies:
62.7%

Market share of top ten companies:
77.6%

Total North American capacity/yr (1992)¹
15,198

Capacity share of top ten companies:

U.S.: 13,482 million short tons.

Canada (est.): 1,716 million short tons.

1. Year-end 1991 capacity. 2. Includes Prince Albert, Sask.

3. Includes carbonless basestock, Gilbert Paper.

4. Includes all other companies. Sources: Company data, Dean Witter, Morgan Stanley, Pulp & Paper estimates.

Domtar shuts newsprint machine as banks pull reins

Domtar Inc.'s banking syndicate has restricted the Montreal-based forest products company from paying common share dividends or making acquisitions in exchange for supporting the firm through its current financial crisis. The banks have also put caps on the company's total debt, borrowing by subsidiaries, and capital expenditures, according to a prospectus for a planned share offering by the struggling company.

In a flurry of activity on the eve of reporting a loss of C\$148 million in 1991, Domtar announced the closure of the one newsprint machine at its Red Rock, Ont., mill and indicated it is re-emphasizing its product focus on its fine papers and packaging businesses. The company also revealed plans to raise C\$300 million in cash, to "get us on solid footing," a company spokesperson said, with plans for the establishment of a new bank credit facility, share offerings in Canada and in the U.S., and conversion of a Quebec government loan. As part of their support for Domtar, the banks have also imposed a form of protection measure that would make all loans payable within 60 days in the event of an unwanted takeover.

Domtar reported sales of C\$1.8 billion in 1991, down 22.0% from 1990, while its 1991 loss of C\$148 million compared with a 1990 loss of C\$294 million, including C\$198 million in

nonrecurring items. The company said it has cut costs by C\$135 million, mainly through plant closings and 3,000 layoffs since 1989. As of late February, an additional 500 jobs were slated to be cut this year.

Red Rock closure. Perhaps symbolic of the company's future role in newsprint, Domtar said it will permanently shut down the only newsprint machine at its Red Rock mill in May and reorganize the facility's linerboard operation. The closure will eliminate 87,000 metric tpy of newsprint capacity and affect about 300 hourly and salaried employees, the company said.

The closure of No. 1 machine will eliminate about 32% of Domtar's total newsprint capacity, with remaining production of standard newsprint and groundwood specialties at Dolbeau and Donnacona, Que. The future of those mills is also in question, with analysts saying the uncompetitive facilities should be closed or sold. But with the show of financial support by the Quebec government agencies in Domtar's future, the possibility of permanently shutting down mills in the province becomes a controversial issue. The Quebec government holds a 42% share in the company.

The company had been demanding that Red Rock workers accept a 20% cut in wages and benefits, as well as a 20% cut in the work force, to

keep the mill open. The Canadian Paperworkers Union (CPU) rejected the proposals, saying it was skeptical about the company's commitment to keep the mill open. "I think I knew deep in my heart there wasn't much hope for the newsprint machine," a union leader said.

The company revealed plans to improve its other paperboard businesses at Trenton and Mississauga, Ont. Analysts indicated that although the company would probably be willing to sell its packaging operation, Domtar enjoys a strong containerboard business in eastern Canada and may seek to expand its role in the northeastern U.S. Domtar management continues to identify the company's fine paper operation as a long-term core business. But as a further obstacle, the company said it faces a C\$420-million price tag to bring its mills into environmental compliance by 1996, if all existing mills remain in operation.

Separately, Hydro-Quebec gave its approval for Domtar to install a cogenerating unit at the company's Windsor, Que., fine papers mill for the production of steam and electricity. The project will cost an estimated C\$170 to C\$200 million, creating 30 permanent jobs when finished. Domtar said it expects the project to cut energy costs at Windsor by 20% and increase production 27%. ■

SALES AND EARNINGS

Canadians again post massive losses

The closing months of 1991 were not good times for producers of newsprint, market pulp, or wood products—the Canadian forest product industry's three most important sources of revenue. A *Pulp & Paper Week* survey of 17 companies showed a net loss, excluding nonrecurring items, of C\$401.8 million on sales of C\$4.1 billion for the quarter ending Dec. 31, 1991. In comparison, this same group posted a C\$188-million net loss on sales of C\$4.5 billion in the year-ago period and a C\$323-million net loss on sales of C\$4.3 billion for the three months ended Sept. 30, 1991. These totals understate the extent of the industry's woes, since any losses associated with the shutdown of facilities, which would have otherwise been

losing money, have been treated as nonrecurring. Inclusive of net nonrecurring items, the 17 companies surveyed suffered an aggregate loss of C\$846 million for the three months ended Dec. 31, 1991, compared with deficits of C\$408 million in the year-ago period and C\$261 million for the three months ended Sept. 30, 1991.

For the full year, this group reported a staggering C\$1.5-billion net deficit, including about C\$435 million in net nonrecurring items, giving credence to the assertion that conditions in the Canadian forest products industry were as bad in 1991 as at any other time in the last fifty years.

Looking to the future, the picture is mixed. Although most industry players will probably post losses in

1992, there are signs that better times may be on their way for some. Most immediately, the lower interest rates should not only soften the burden of high debt within the industry but also are expected to pave the road for improved results in the wood products sector. And market pulp producers are cautiously optimistic that prices bottomed in late 1991—the speed and extent of this market's recovery, however, is in question.

Another boost to corporate bottom lines in 1992 should be provided by widespread cost cutting and restructuring efforts undergone in the last two years. In addition, the recent decline in the Canadian dollar (relative to its U.S. counterpart) should help. (A one-cent move in the exchange

rate boosts the pretax earnings of this group by an estimated C\$100 to C\$150 million.) But there is still plenty of room for concern. Newsprint producers face a particularly daunting 1992, during which costs are going to be incurred either in the shutting down of marginal capacity or else through chronically depressed pricing. Finally, the possibility of labor disruptions this spring, in British Columbia and/or eastern Canada, is a key wild card.

Newsprint producers reeling. Canadian Pacific Forest Products Ltd. had the unwanted distinction of posting the largest 1991 deficit (C\$572 million) in the industry as each one of CP Forest's businesses reported a deficit for the year. The heaviest operating loss (C\$185.3 million excluding non-recurring items) was generated at the newsprint segment, but the most severe decline in profitability was at the company's pulp operations, where a C\$119-million operating profit in 1990 turned into a C\$90-million deficit in 1991. The C\$572-million figure also includes charges related to anticipated closure and downsizing costs and a write-down of its paperboard and packaging businesses offset by gains related to its divested Facelle tissue subsidiary.

Abitibi-Price Inc.'s reported net loss totaled C\$75.9 million, including about C\$27.5 million in nonrecurring costs related to the restructuring and downsizing of certain facilities, which included closure of a newsprint mill at Thunder Bay, Ont., and a paper coating operation in Georgetown, Ont. On a more positive note, Abitibi-Price, one of the first companies to recognize that newsprint markets were going to struggle in the early 1990s, has managed, through asset sales and cost cutting efforts, to maintain a strong financial base.

From Riches to Rags. In 1990, the two most profitable forest products companies in Canada were British Columbia-based Fletcher Challenge Canada Ltd. and MacMillan Bloedel Ltd., but the tables turned in 1991. Despite a C\$47.5 million contribution from its Dutch fine papermaking subsidiary, KNP, MacMillan Bloedel reported a C\$93-million net loss. Looking forward, MB's president and CEO, Bob Findlay, cautioned that the company "still faces complex problems in the next few years, the most serious of which is that the Canadian industry is no longer cost-competitive with

the U.S. We must face the fact and deal with it quickly."

The story at Fletcher Challenge Canada was very similar. Reduced demand and weak prices made 1991 one of the most difficult years in the company's history and, although FCC's president and CEO, Ian Donald, said the company expects 1992 to produce some modest improvements in its

market areas, he cautioned that the rate of recovery is likely to be slow. The only Canadian companies reporting profits from continuing operations were Scott Paper Ltd. and Cascades Inc., while greater optimism in the wood products business and the apparent bottoming of pulp markets are brightening prospects at a number of western Canadian firms. ■

Canadian paper and forest products company sales and earnings.

Company	Full year 1991 (C\$000)			
	Sales 1991	% change 1991/90	Earnings' 1991	Earnings' 1990
Abitibi-Price Inc.	C\$2,800,500	-9.3%	C\$ (48,370)	C\$ (16,860)
Canadian Pacific Forest Products Ltd. ¹	1,979,500	-5.7	(261,500)	(16,800)
Canfor Corp.	822,500	-7.0	(96,400)	(22,400)
Cascades Inc.	806,205	-1.5	19,657	26,837
Crestbrook Forest Industries Ltd.	165,400	-24.9	(16,414)	11,000
Domtar Inc. ²	1,804,000	-22.0	(148,000)	(96,000)
Donohue Inc. ³	469,900	-23.1	(5,900)	29,100
Fletcher Challenge Canada Ltd.	1,037,600	-10.6	(61,600)	33,900
MacMillan Bloedel Ltd.	2,726,200	-9.2	(73,400)	50,800
Noranda Forest Inc.	4,118,000	-9.6	(185,000)	(95,000)
Repap Enterprises Corp. Inc.	1,065,300	-13.2	(150,700)	3,100
Rolland Inc.	302,928	-24.7	(7,726)	(3,464)
Scott Paper Ltd.	434,791	-9.0	12,321	13,847
Slocan Forest	192,400	-3.4	(14,200)	(1,300)
Tembec Inc. ³	256,718	7.9	(27,095)	18,374
Weldwood of Canada Ltd.	661,700	-3.2	(33,100)	5,400
West Fraser Timber	533,900	-1.2	(16,500)	3,400
Total⁴	C\$17,451,342	-10.8%	C\$(1,085,127)	C\$(81,466)

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years. () = losses. 2. CP Forest. 1991 earnings exclude charges of \$368.1 million, all booked in the fourth quarter, related to the shutdown, downsizing, and write-down of certain operations. 1991 earnings exclude \$58.1-million gain from this continued operations, of which \$400,000 was booked in the fourth quarter. 1990 earnings exclude \$7.4-million gain from the discontinued operations, of which \$2.5 million was booked in the fourth quarter. 3. Domtar. 1990 earnings exclude unusual charges of \$237 million, all booked in the fourth quarter, and \$39 million in profits from discontinued operations, of which \$10 million was booked in the fourth quarter. 4. Donohue. 1991 earnings exclude nonrecurring losses of \$52.1 million, of which \$32.7 million was booked in the fourth quarter. Tembec. Latest quarter (ended Dec. 31) is the first quarter of Tembec's 1992 fiscal year. Full-year results are for 12 months ended Sept. 30. 1991 earnings exclude \$27 million unusual loss. Totals. Noranda Forest accounts for MacMillan Bloedel, in which it has a roughly 50% stake, as a consolidated subsidiary. Accordingly, to avoid double counting, MB's sales and half of its earnings are excluded from the totals line.

CONTAINERBOARD

Weyco to spend \$70 million at Springfield

Weyerhaeuser Paper Co. said it will proceed with a \$70-million recycling and machine modernization project for its Springfield, Ore., kraft linerboard mill. Construction is scheduled to begin later this year and will be completed by the end of 1993, lifting capacity at the 1,570-tpd mill by ap-

proximately 15%, or 225 tons, said Richard Hanson, vice president and mill manager.

The Springfield project was originally announced in 1990, but was later put on hold because of poor business conditions in the containerboard market. About \$45 million of the capital

Proper Design, Control Strategies Can Help Mills Cut TRS Emissions

Amendments to the Clean Air Act push the pulp and paper industry to reduce total atmospheric sulfur emissions

By JERRY W. GARNER

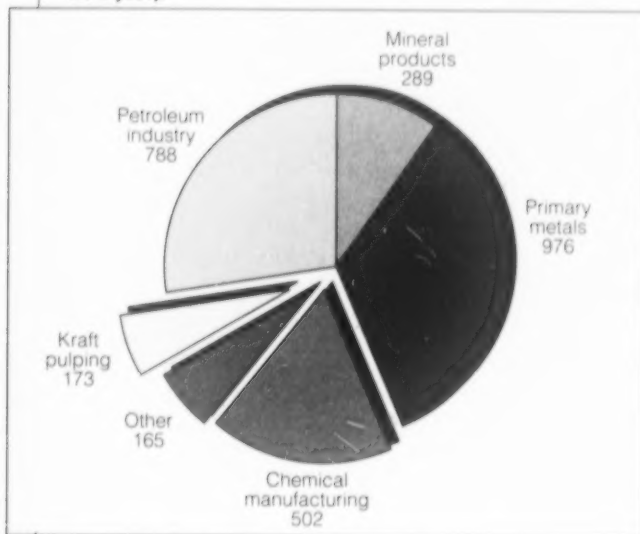
The Clean Air Act was promulgated in 1970 and substantially amended in 1977 and 1990. Preservation of ambient air quality is the goal of the statute. In the pulp and paper industry, atmospheric emissions of sulfur gases and particulate matter are the principal issues.

Total atmospheric sulfur emissions from the pulp and paper industry are small in comparison with emissions from the electric utility industry and other major industrial sources. Figure 1 illustrates a relative comparison of sulfur emissions from the pulp and paper industry and other major industrial processes.

This comparison of atmospheric sulfur emissions is based on an Environmental Protection Agency (EPA) sulfur dioxide (SO₂) inventory taken in 1985 and a

Mr. Garner is manager-power and recovery projects, Jaakko Poyry Inc., Raleigh, N.C.

FIGURE 1: Sulfur emissions from select industries (1,000 tons/year).

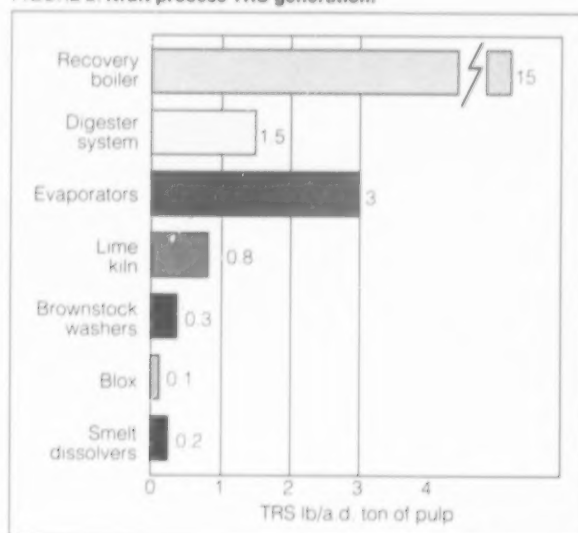


Jaakko Poyry estimation of total reduced sulfur (TRS) emissions from the pulp and paper industry, expressed as equivalent sulfur dioxide.

WHERE TRS COMES FROM. Major gaseous emissions from kraft pulping and papermaking processes are reduced sulfur compounds, principally hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. These compounds are extremely odorous and can be detected at threshold levels of 1 to 10 ppb (parts per billion) by volume. Consequently, the pulp and paper industry has committed significant human resources and capital expenditures to control TRS emissions. Capital expenditures for air emission control projects scheduled to start up in 1990 were estimated to exceed \$600 million.

Typical TRS generation in the kraft pulping process is illustrated in Figure 2. Major sources of TRS generation in the kraft process include digester blow and relief gases, pulp washer hood and seal vents, multiple-effect evaporator hotwell vents, chemical recovery boiler flue-

FIGURE 2: Kraft process TRS generation.



gas, smelt dissolving vents, black liquor oxidation tanks, and lime kiln fluegases. Technological advances in the pulping process since promulgation of the Clean Air Act have allowed significant reductions in atmospheric discharges of TRS.

Advanced process and emission control technology can result in kraft mill TRS emissions to the atmosphere of approximating 1 lb/a.d. ton of pulp production, as illustrated in Figure 3.

TRS generation in the recovery boiler originates in the furnace from combustion of organic and inorganic sulfur compounds used in the pulping process and from the direct-contact black liquor evaporator, if included in the boiler design. Recovery boiler TRS emission control technology includes modification of direct-contact evaporator design and sundry boiler process control techniques. Process control advancements may include refined combustion air controls, control of black liquor fuel moisture content and spray pattern, and smelt bed control.

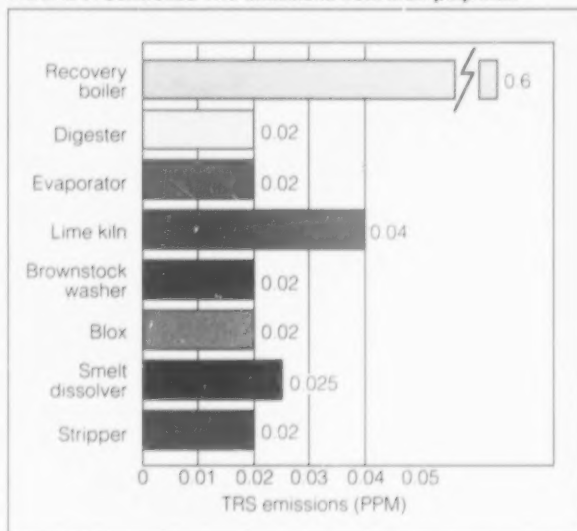
The principal source of digester-area TRS generation is noncondensable gases liberated during the digestion of woodchips at elevated temperature and pH in an inorganic sulfur solution. Common control technology for digester-area TRS emissions is to collect and treat the malodorous noncondensable gases by alkaline scrubbing or combustion. Noncondensable gases are combusted in an existing mill boiler or lime kiln. Alternatively, a dedicated incinerator with fluegas scrubbing may be installed for TRS gas disposal. Pulp washer hood vents may also be included in the TRS gas collection and disposal system design.

Atmospheric emissions of TRS from the multiple-effect evaporators originate as noncondensable gases liberated from the spent pulping liquor. These malodorous sulfur gases are liberated during evaporation of water from the pulping liquor at elevated temperatures. Effective TRS emission control strategy is to collect the noncondensable gases for treatment by scrubbing or combustion.

Sources of lime kiln TRS emissions are sulfur-bearing streams entering the kiln, including lime mud, mud washwater, fossil fuel, and noncondensable gases. Typical control technology includes efficient washing of lime mud using freshwater and conservative mud filter design, alkaline scrubbing of noncondensable gases prior to combustion, and use of low-sulfur-content fossil fuel. Advanced combustion controls for the lime kiln allow control of the excess air, residual fluegas oxygen, and cold end temperature for reduced TRS emission from the kiln. If fluegas scrubbing is included in the kiln system design, operation with an alkaline scrubber water solution provides minimum atmospheric TRS emission.

Black liquor oxidation (BLOX) systems are used in conjunction with chemical recovery boilers having direct-contact evaporator design. Direct-contact evaporators use the sensible heat of the boiler fluegas in direct contact with the black liquor fuel to evaporate moisture from the fuel. Malodorous TRS gases are stripped from

FIGURE 3: Controlled TRS emissions from kraft pulp mill.



the black liquor fuel by the fluegas and are discharged into the atmosphere.

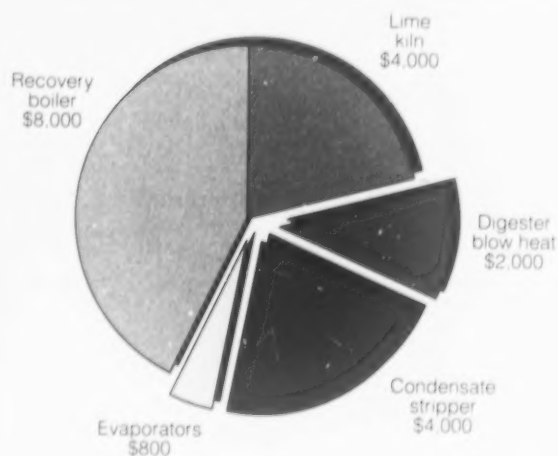
A BLOX system is designed to oxidize the reduced sulfur compounds in the black liquor prior to contact with the boiler fluegas, thereby reducing TRS emission to the atmosphere. However, large volumes of compressed air are used in the BLOX system, and the off-gas contains residual concentrations of TRS compounds. Common TRS emission control strategy is to combust the large volume of BLOX off-gas as combustion air in an existing boiler.

A principal product from the chemical recovery boiler is a smelt stream of inorganic reduced sulfur chemicals that are recycled in the kraft pulping process. The molten smelt stream is dissolved in an aqueous solution, and vent gases are liberated. The vent gases contain residual concentrations of TRS compounds. Common control technology for atmospheric TRS emission from the smelt dissolver is either alkaline scrubbing or combustion of the vent gases. Effective process control would dictate the use of sulfur-free freshwater as vent gas scrubbing medium.

Foul (malodorous) condensates are generated due to vapor condensation in the digester and evaporator process areas. These process condensates contain relatively high concentrations of TRS compounds, which tend to volatilize at atmospheric conditions. Condensate stripping is commonly used to volatilize TRS compounds; the stripped condensates can then be recycled in the kraft pulping process. However, the stripper will produce overhead gases with high concentrations of TRS compounds. The overhead gases are typically incinerated for TRS emission control.

COSTS FOR COMPLIANCE. Capital cost estimates for recent TRS compliance projects in several kraft pulp mills are presented in Figure 4. Capital costs for recov-

FIGURE 4: Expenditures for TRS-control retrofit (costs in thousands).



ery boiler compliance approximate \$8 million and include necessary provisions for the replacement of the direct-contact evaporator with extended economizer de-

sign and additional black liquor evaporator capacity for liquor fuel drying. Evaporator process capital costs approximate \$800,000 and include foul condensate segregation in the appropriate evaporator effects and condensate handling.

Digester-area capital costs for TRS compliance are estimated at \$2 million and include provisions for efficient blow heat vapor recovery, foul condensate collection and handling, and miscellaneous collection of concentrated TRS gas streams. Capital estimation of almost \$4 million includes a foul condensate stripper system to volatilize TRS compounds generated in the digester and evaporator areas and to produce clean condensate for recycle.

Estimation of capital costs of \$4 million for lime kiln TRS emission compliance includes additional lime mud filter capacity, a noncondensable gas transportation system, and a noncondensable gas combustion system.

Total capital expenditures for TRS compliance average about \$50/ton of annualized pulp production capacity. In summary, TRS emission compliance can be readily achieved in existing or greenfield kraft pulp mills utilizing proven technology. Capital expenditures can be minimized by judicious design, deliberate integration of new and existing equipment, and aggressive competitive bidding of new equipment. ■



Quality is the Ticket to Success



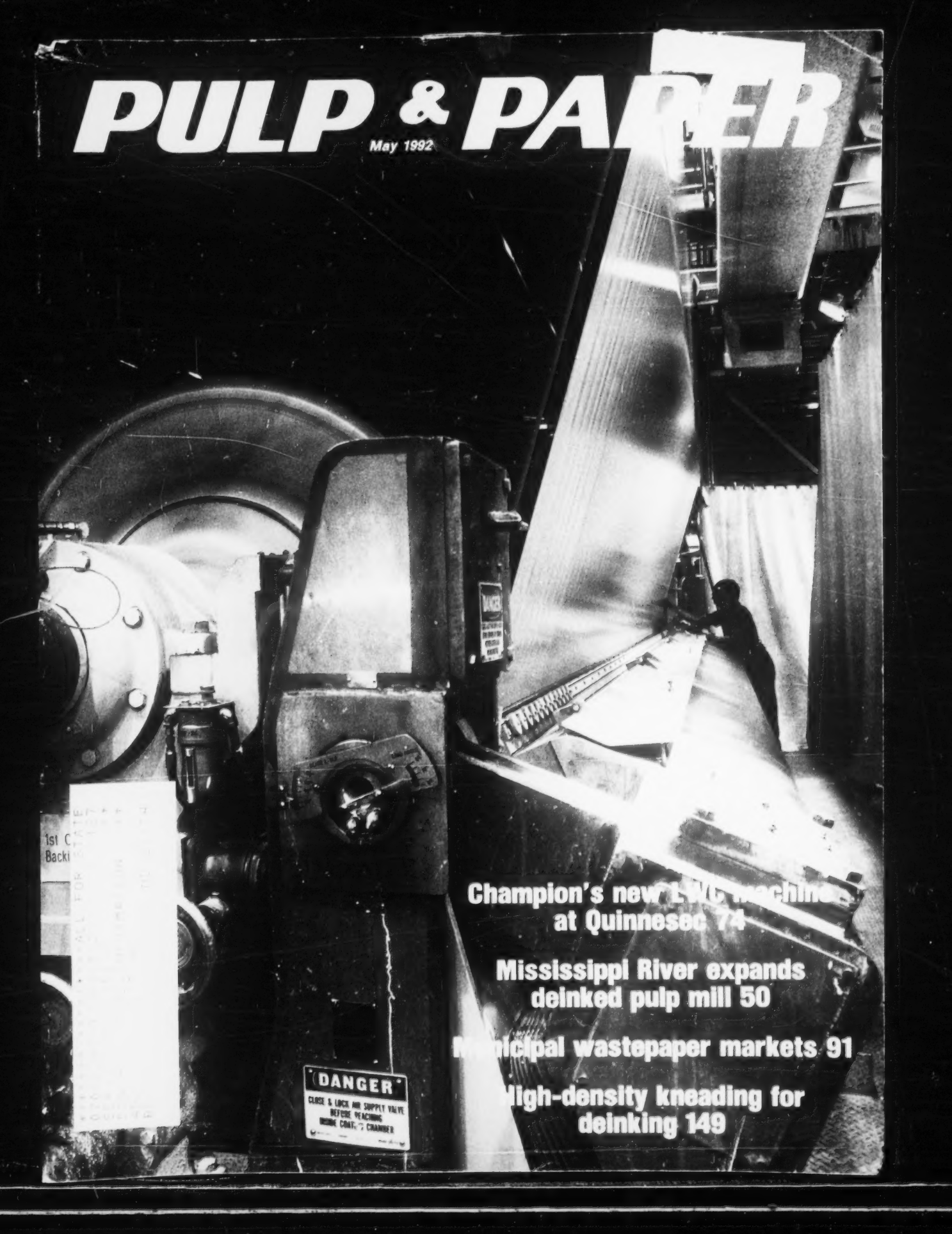
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PULP & PAPER



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CLOSE & LOCK AIR SUPPLY VALVE
BEFORE REACHING
HORN COAT CHAMBER



THE COVER

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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean. US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests: subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. Send subscription correspondence to: Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.



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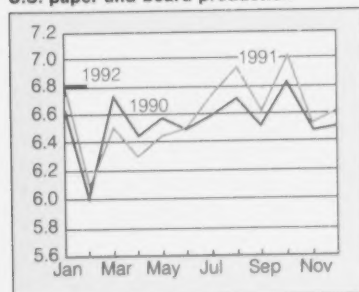
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MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.8 million tons in January, down 0.2% from the same month last year, according to the American Paper Institute. Paper production was off by 1.4% from January 1991, while paperboard output exceeded its year-earlier mark by 0.9%. Paper continued its six-month downward trend, and the trend rate for paperboard dipped sharply from December 1991 after a steady series of increases that began last May.

Among major grades, printing and writing paper shipments were off 4.2% in January, hurt by weakness in commercial printing and magazine advertising. Business papers showed smaller declines. Containerboard production for export was down 5.8% in January, offsetting a 2.1% increase in output for the much larger domestic market. Overall, containerboard posted a 1.4% increase for the month. Inventories of containerboard rose 12% from December 1991 to January 1992 but were off 3.6% from a year earlier.

Canadian newsprint shipments totaled 662,000 metric tons in January, down 13.6% from January 1991. Woodpulp shipments climbed 0.3% to 615,000 tons. Canadian producers began the year with operating rates of 80% for newsprint mills and 90% for pulp plants.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Jan.	607	5.4	7,285	5.4
Uncoated groundwood (s)	Jan.	128	-11.7	1,536	-14.6
Coated paper (s)	Jan.	597	-5.8	7,165	-5.8
Uncoated free-sheet (s)	Jan.	969	-1.4	11,624	-1.8
Other printing/writing	Jan.	119	-6.3	1,433	-8.0
Total packaging and other paper (s)	Jan.	397	2.3	4,759	1.9
Tissue	Jan.	480	-1.0	5,760	-1.1
Total paper	Jan.	3,297	-1.2	39,562	-1.4
Unbleached kraft paperboard	Jan.	1,841	1.0	22,092	1.0
Semichemical medium	Jan.	505	1.2	6,062	1.3
Bleached paperboard	Jan.	365	-6.6	4,376	-6.8
Recycled paperboard	Jan.	799	4.2	9,588	4.2
Total paperboard	Jan.	3,510	0.9	42,119	0.9
Total U.S. paper and paperboard output	Jan.	6,807	-0.2	81,681	-0.2

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Jan.	5,681	1.8	68,166	1.8
Market pulp production	Jan.	845	10.6	10,147	11.2
Wastepaper consumption at paper/board mills	Jan.	2,029	11.7	24,346	7.4
Pulpwood consumption (cords)	Dec.	8,006	-0.1	98,242	-0.9

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ³)	Jan.	28,934	5.5	28,934 ⁴	5.5
Containerboard inventories at U.S. box plants and mills	Dec. 31	2,670	-3.4		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Dec.	937	-3.2	12,074	-7.2
Imports of Canadian newsprint	Dec.	564	-8.0	7,380 ⁶	-9.1
U.S. paper exports (including products)	Dec.	701	34.0	8,311	22.5
Exports of unbleached kraft linerboard	Dec.	259	28.9	3,027	16.9
Exports of woodpulp	Jan.	514	8.2	6,165	8.1
Norscan pulp inventories ⁴	Jan. 31	1,369	-9.5		
Norscan pulp operating rates ⁴	Jan.	91%	85%	85%	87%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Jan.	662	-13.6	662 ⁶	-13.6
Operating rates	Jan.	80%	95%	80%	95%
Inventories held by U.S. consumers	Jan. 31	1,290	-5.6		
Other paper/board shipments	Jan.	615	0.7	615	0.7
Woodpulp shipments (export only)	Jan.	693	0.3	693	0.3
Operating rates	Jan.	90%	89%	90%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Coated groundwood: Major markets continue economic retrenchment

Grade structure: Coated groundwood papers are generally accepted as paper with 10% or more mechanical pulp. Coated groundwood is often referred to as lightweight coated (LWC), though basis weights for LWC are typically 40 lb or less (sometimes 45 lb), and basis weights of coated groundwood grades can go higher. Most coated groundwood is coated two side (C2S). Coated groundwood papers represented 55% of all U.S. coated paper shipments in 1991, down slightly from 1990 because of large increases in coated free-sheet capacity.

Most coated groundwood paper is classified as Nos. 4 and 5. Half of No. 4 papers produced is groundwood and all but a few thousand tons of No. 5 is groundwood. No. 5 papers make up about 49% of the total U.S. coated paper produced. Slightly more than 15% of total Canadian printing/writing papers production (uncoated groundwood, uncoated free-sheet, and coated) is coated paper. Coating weight is approximately 30% of total sheet weight for LWC papers.

Coated groundwood papers are commonly made in the 32-to-50-lb range (25 x 38 in. in reams of 500), although basis weights can run as low as 26 lb and as high as 70 lb. The two major end uses are commercial printing and magazines, followed by catalogs, Sunday newspaper supplements, newspaper advertising inserts, directories, and books.

Magazine and catalog publishers have been asking for lower basis weight papers (32 lb is popular in weekly newsmagazines) to offset higher mailing costs, and more are looking at using recycled grades. In fact, Time Warner has converted three of its magazines to recycled-content paper from various suppliers. Last year, U.S. mills lost their dumping complaint against European mills, some of which have excess capacity in coated groundwood paper and the competing supercalendered papers.

Production/capacity: The top ten coated groundwood producers represent almost 90% of North American

capacity. The five largest coated groundwood producers are Champion International Corp., International Paper Co., Consolidated Papers, Repap Enterprises Inc., and Bowater Inc., which acquired Georgia-Pacific Corp.'s Great Northern Div. in Maine last year. U.S. coated groundwood capacity is projected by the American Paper Institute to rise just 3% in the 1991-94 period when it will reach over 4.5 million tons, a drop in the estimate from the previous capacity survey. The next major addition is not likely until 1994, when Boise Cascade Corp. may start up a new machine at Rumford, Maine. Bowater may convert some additional capacity in Maine to coated in the meantime.

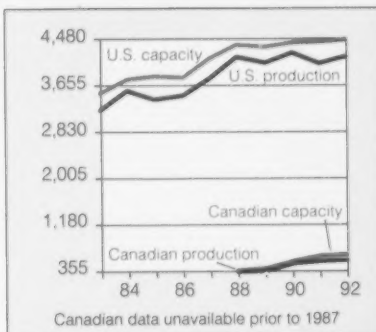
Canadian coated groundwood capacity will increase from 419,000 short tons in 1989 to about 661,000 tons in 1992.

Outlook: Magazine publishers and printers purchase about 50% of the total coated groundwood paper produced in the U.S. But the continued shakeout in general interest magazines, along with reductions in catalog printing caused by business failures and higher postal costs, have eaten into coated groundwood profits. Magazines and periodicals may not recover advertising revenue until 1993. Newspaper supplements also suffered the same fate.

Magazine publishers expect to cut overall paper use, according to the annual paper survey by the Magazine Publishers of America (MPA). Total paper tonnage used by magazines dropped 4.1% to roughly 1.587 million tons in 1991 from 1.656 million tons in 1990. The drop in 1992 is forecast at 0.3%. Coated groundwood papers represent about 66% of total magazine paper use in 1991, but declined in use 4.7% in 1991 and will gain back only a meager 0.6% in 1992.

Prices: Historical transaction pricing trends (\$/short ton, year-end) for 34-lb No. 5 roto paper are as follows: 1987, \$890; 1988, \$990; 1989, \$966; 1990, \$940; 1991, \$880. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990	1991r	1992e
Production ¹	4,233	4,044	4,165
Capacity ²	4,414	4,426	4,463
Utilization rate	95.9%	91.4%	93.3%
Imports	665	650	673
Exports	140	150	157
Apparent U.S. consumption	4,758	4,544	4,681
lb/capita	38.07	35.97	36.78
GDP ratio ⁴	0.97	0.94	0.94

Canada	1990	1991r	1992e
Production ¹	501	543	559
Capacity ²	546	636	661
Utilization rates	91.8%	85.4%	84.6%
Exports ^{1,4}	561	583	600

r=Revised. 1. Pulp & Paper estimates. 2. American Paper Institute. 3. Canadian Pulp & Paper Assn. 4. More than 95% shipped to U.S. 5. 000 tons/billion \$ real GDP.

TOP NORTH AMERICAN PRODUCERS

	Annual capacity (000 tons)	Market share (%)
1. Champion International	715	13.8
2. International Paper ¹	610	11.7
3. Consolidated Papers ¹	615	11.8
4. Repap Enterprises	600	11.5
5. Bowater ²	480	9.2
6. Blandin Paper ³	421	8.1
7. Boise Cascade	390	7.5
8. Mead	310	6.0
9. James River	260	5.0
10. Pentair ⁴	220	4.2

Total North American capacity (1992):
5.198 million tons

U.S.: **4.533 million short tons**
Canada: **645,000 short tons**

Capacity share of top five companies:
58.1%

Capacity share of top ten companies:
83.9%

1. Pulp & Paper estimate. 2. Includes Great Northern Paper Inc. 3. Subsidiaries of Fletcher Challenge Canada Ltd. 4. Niagara, Wis.

Mississippi River Corp. Starts Up Idled Mill to Produce Deinked Pulp

Former molded pulp mill in Natchez, Miss., is currently adding a third deinked market pulp line for a total capacity of 270 tpd

By KEN L. PATRICK, Editor in Chief

By mid-summer, Mississippi River Corp. will bring its third 90-tpd deinked market pulp line onstream at Natchez, Miss. Together with similar 90-tpd lines started up in December 1990 and June 1991, MRC will then have the capacity to produce 270 tpd of high-quality market pulp from deinked wastepapers. A fourth 90-tpd line is scheduled for startup in the fourth quarter of this year.

North American Paper Co., a pulp broker in Worthington, Ohio, and a sister company to MRC (same stockholders but operated as separate corporations), bought the mill in 1990 from American Tissue Corp., which had planned to make tissue products there. Prior to American Tissue's acquisition, Diamond International Corp. produced recycled molded pulp products at the southwestern Mississippi plant for approximately 17 years, ceasing operations in 1983.

The 83-plus GE-brightness pulp currently produced

at MRC is targeted primarily for use in printing and writing papers and coated publication grades. It is marketed basically as a hardwood pulp, but contains as much as 30% softwood fibers. Average dirt count is 5 or less, and the ash content is typically 3% or less. Canadian Standard freeness averages 475 or higher. No ground-wood fibers are used in the process.

Engineering and construction was handled by MRC. The mill has an operating staff of about 75, with some 12 being management, supervisory, and office personnel.

FIBER SUPPLY. According to George Matthews, vice president and chief operating officer, the mill receives a broad range of nongroundwood-containing wastepapers from a large geographical base generally east of the Mississippi River. MRC is also working with local collection groups to develop recyclable fiber in the immediate areas.

"North American Paper Co. is the guiding force behind the development of MRC. They have been in the secondary-fiber/high-grade wastepaper business for



Mississippi River Corp. restored the former Diamond International molded pulp mill in Natchez, Miss., to produce deinked market pulp. By the end of 1992, MRC will have four deinked pulp lines operating at the mill, producing 360 tpd.



MRC's groundwood-free wastepaper furnish includes ledger and mixed book and magazine papers, as well as other paper and paperboard printed with various inks, including laser and other "thermo-set" inks.

more than 50 years, and the Natchez mill was a natural adjunct to their existing operations. North American has been responsible for development of the raw material base for MRC. Also, since they sell prime, off-grade, and secondary-fiber products, they serve as the primary sales arm for MRC's deinked pulp," Matthews explained.

Groundwood-free wastepapers recycled at the mill include ledger and mixed book and magazine papers, as well as other paper and paperboard printed with various inks, including laser and other "thermo-set" inks. The final product is 100% deinked, with a high percentage of postconsumer content. "We tailor our grades to meet customer requirements, although we are not a speciality mill," Matthews said.

While explaining that most inks are removable in MRC's process, Matthews pointed out that some, such as ultraviolet (UV) inks, do represent a contaminant to the system. "We can use laser inks as long as we carefully control the amounts. When dealing with mixed office papers or office ledgers, you're going to get laser or thermographic ink content. We run our system by determining a recipe that meets all of our quality criteria and the customer's needs, but doesn't overdose the system," he emphasized.

MARKETING. According to Matthews, MRC's customer base is large paper mills across the spectrum of fine printing and writing grades, coated publication, and copy papers. The pulp is marketed as a recycled post-consumer component that is used with bleached virgin kraft fibers to produce a sheet with superior smoothness, strength, and printability characteristics.

"Recycled newsprint, corrugated containers, and other paperboard products have been on the market for

some time now, but producers of the high-quality fine papers and publication grades are beginning to recognize that there is a growing market for recycled contents in these grades. While this market is still in its infancy, high-quality recycled pulps such as ours will help it to mature," Matthews pointed out. "In fact, the demand for recycled kraft pulp has spurred our two expansions and is the reason why we are now going ahead with the fourth deinking line later this year."

MRC is also selling some of its deinked pulp for use in coated basestocks, which is a growing market. The mill is also examining the potential for use in newsprint, but at this time, it is not actively marketing into the groundwood sector, although it has had discussions with some producers.

Matthews added that although MRC markets primarily to large printing, writing, and groundwood-free publication paper mills, it also has some smaller speciality-type mills in its customer base. "Some of our customers buy only one or two truck loads a month, and we are very comfortable with that. We are not trying to supply only the large volume customers. Our plans are to be a supplier of choice to a variety of customers."

Recycled groundwood-free pulp is currently attracting a healthy premium in relation to some virgin bleached chemical market pulp. However, Matthews said that MRC did not set their price in relation to charging a premium when the mill started up in December 1990.

"Demand for recycled market pulp was really not very strong when we started up, for several reasons. First, there were already several recycled pulps on the market and mills had been using them with varying degrees of success. Second, we targeted some very demanding applications, and many mills were somewhat reluctant to try recycled pulps because of some bad experiences.

"Modern paper machines, and especially coated pa-

TABLE 1: Market deinked pulp producers—existing and proposed.

Company/location	Deinking capacity (tpd)	Startup date
Ponderosa Fibres of Amer. Inc., Santa Ana, Calif.	150 ¹	1986
Ponderosa, Augusta, Ga.	180 ¹	1970
Ponderosa, Oakshoah, Wis.	250 ¹	1972
Ponderosa, Memphis, Tenn.	240 ¹	1974
Desencrage Cascades Inc., Breakeyville, Que.	110 ¹	1986
Mississippi River Corp., Natchez, Miss.	90	1990
Mississippi River, Natchez, Miss.	90	1991
Newstech Recycling Inc., Coquitlam, B.C.	390 ¹	1991
Mississippi River, Natchez, Miss.	180	1992
Kieffer Paper Mills Inc., Brownstown, Ind.	110	1992
EcoFibre Inc., DePere, Wis. ²	—	1992
Fox River Fibre Co., DePere, Wis.	220	1992
Cascades Inc., Cap-de-la-Madeleine, Que.	330	1992/93
Minnesota Pacific, Port of Duluth, Minn.	200	1993
Superior Recycled Fiber, Duluth, Minn.	250	1993
Caithness King Co., Mich.	300	1993
American Power, Barrackville, W. Va.	400	1994
DeNovo/Southern Electric, Fredericksburg, Va.	150	—

1. Current capacity. 2. EcoFibre will provide a varying amount of this deinked pulp to its parent, Riverside Paper Corp.
Source: *Pulp & Paper Week*.



Ronnie Boles of MRC makes a final inspection of the 100% deinked pulp before shipment. The 83-plus GE brightness pulp is targeted primarily for use in printing and writing papers and coated publication grades.

per machines, can be very demanding, and it is extremely difficult to produce a recycled pulp that is going to perform well in these highly technical applications. Customer reactions to our trials often took six to eight weeks, i.e. before paper could be produced, sold, printed, and finally evaluated by the end user.

"The economics had to be analyzed, discussed, and examined in relation to the quantities that could be produced for various products, especially completely new product lines. Thus, the first three to four months of 1991 were used for developing the markets and feeling our way through our production capabilities. Actually, this development period continued through most of last year, although things have now become much faster and more efficient.

"We have been able to come as far and as fast as we have for one primary reason. From the first day of operation, we focused directly on quality, not quantity. We started up one line, got it right, then slowly and cautiously proceeded to the next. We established high standards immediately and often deliberately limited production to maintain those standards," Matthews emphasized.

BALE INSPECTION, HANDLING. The raw materials purchased are generally presorted and baled. The mill routinely inspects and tests bales to ensure they meet its demanding quality requirements. In handling waste-paper going into the process, operators will also sort and inspect for any potential contaminants, such as pieces of

corrugated boxes, groundwood, plastics, wood, wire, glass, bindings, glues, etc.

"We believe the cornerstone of our operation is the careful selection of our supply sources, rigid inspection prior to introduction into our system, and testing during various stages of our production process," Matthews said. "This, in addition to state-of-the-art technology, ensures that we maintain our position as a producer of high-quality recycled pulp in the industry."

PROCESS DETAILS. The old Diamond International plant was basically intact when MRC took it over. But, initially, only about 30% of the 310,000-ft² building complex was usable. A high percentage of the existing Diamond International process equipment was restored or rebuilt. Piping had to be rerouted and portions of the process equipment reconfigured. In fact, the entire process segment following deinking had to be installed by MRC.

The deinking lines, according to Matthews, were installed by Diamond as an add-on facility during the 1970s. They were used at that time to deink old newspapers (ONP). Currently, they are operated as flotation units in conjunction with washing.

The two lines are not separate and distinct production lines. Two Black Clawson Hydrapulpers feed a single line, so two lines cannot be operated with different furnishes since they come together again at several different points. They have common sidehill screens, course screens, pressure screens, and cleaners, for example.

The mill uses a combination of several chemicals in its process. However, Matthews said they do not intend to use any chlorine or chlorine compounds in the system.

Furnish from the deinking operation is taken through several stages of dewatering, before being sent to the baler press. Final a.d. consistency is about 58%. The pressurized bales of fiber from the baler measure about 42 in. long x 30 in. wide x 40 in. high. Shipping is either by truck or railcar.

Furnish is tested periodically at various stages in the process. Samples are sent to the mill's laboratory on a continuous basis so that any quality-related problems can be located, identified, and corrected as soon as possible. The finished product quality is also carefully tested and monitored.

WASTE TREATMENT. Water discharges from the process are taken through a series of clarifiers and an aeration lagoon. Sludge from waste treatment, comprised mainly of inks, clay, and fiber, passes through a dewatering press before being sent to MRC's landfill. Currently, none of the clarified water is sent back to the process, but this is being considered for the near future.

Matthews reported that the State of Mississippi and the county have been extremely cooperative and helpful in the environmental area. Landfill and water discharge permitting has gone very smoothly.

Water for the mill's process comes from wells, and power is purchased from Mississippi Power & Light. ■

Wastepaper Market Evolving as Demand Changes Collection Infrastructure

Location and consumption patterns of mills will boost use of certain grades and require reliable supplies

By FRED D. IANNAZZI and RICHARD STRAUSS

Editor's note: This article is based on information contained in various reports published by Andover International Associates (AIA). All tons in this article are metric.

Major changes in the markets for recycled paper recovered by municipalities (old newspapers and old magazines) and by commercial establishments (old corrugated containers and office wastepaper) are projected over the next few years, according to Andover International Associates (AIA). These changes, in turn, will affect future regional planning for municipal solid waste (MSW) processing and disposal facilities.

Some of AIA's definitions of wastepaper differ from the typical definitions used by the industry. AIA includes inserts and flyers in with newspapers in the category of old newspapers (ONP), and catalogs are included with magazines in old magazines (OMG). In this way, AIA's figures reflect conditions encountered in the field by both collectors and users of recycled paper, and the categories are determined by what is actually obtained in municipal and commercial collections.

The effect of AIA's inclusion of other grades with ONP, for instance, is to increase the potential supply of ONP and reduce the percentage of ONP recovery as compared to other industry statistics that do not include inserts and flyers. Thus, AIA's U.S. recovery rate for ONP in 1991 was 42%, compared to the 52% recovery reported by other industry sources.

U.S. AND CANADIAN MARKETS FOR ONP. According to AIA's recently completed study of present and projected paper recycling facilities, "The Guide to Marketing Recycled Paper in North America: 1991, 1993, and 1995," 158 U.S. mills and 16 Canadian mills consumed about 5.4 million tons of ONP in 1991 (see Table 1). In this total of 174 mills, 15 mills each consumed 50,000 tpy or more of ONP, or a total of roughly 1.5 million tons.

Mr. Iannazzi and Mr. Strauss are with Andover International Associates, Danvers, Mass.

The remaining 3.9 million tons of ONP consumption was split among the remaining 159 mills, an average of about 25,000 tpy per mill.

Large and small ONP recycling mills differ in the quality of ONP and assurance of continuity of supply. Almost all the mills that consume 50,000 tpy or more of ONP are newsprint mills, while none of the mills that consume less than 50,000 tpy of ONP are newsprint mills. Smaller mills primarily produce paperboard—such as chipboard and clay-coated boxboard—or tissue. The quality of ONP used in these applications is generally not suitable for use in newsprint, which requires ONP with no dirt or other contaminants, or "junk mail" or other sources of uncoated free-sheet paper. In addition, OMG will either be specifically accepted or excluded. A reasonable quantity of OMG is generally acceptable with the ONP in nonnewsprint applications.

In addition to the difference in ONP quality required by large and small mills, large mills draw from multi-state areas and generally require relatively firm supply commitments, and small mills draw from local areas and generally purchase on an as-required basis.

The North American market for ONP will increase from 5.4 million tons in 1991 to 6.2 million tons in 1993 and to 8.4 million tons in 1995. Essentially, all the increases will be in new recycling facilities consuming 50,000 tpy or more of ONP. The products of the new large facilities will be newsprint, printing/writing paper, or market pulp—all applications that require higher-quality ONP. Thus, any new or expanding recycling programs must be prepared to provide high quality and a reliable supply of ONP.

TABLE 1: North American markets for old newspapers.

	1991	1993	1995
Total consumption (000,000 metric tons)	5.4	6.2	8.4
Number of ONP-consuming mills:			
U.S.	158	163	175
Canada	16	23	28
Total	174	186	203
Number of mills consuming 50,000 tpy or more of ONP:			
U.S.	12	17	25
Canada	3	10	15
Total	15	27	44
Source: Andover International Associates.			

The locations of larger ONP-consuming mills will also change. Currently scattered geographically, most are located in or near major population centers. However, the major ONP-consuming mills projected to be installed between 1991 and 1995 are generally located at existing newsprint mills, remote from major population centers, and they will be primarily concentrated in a few regions: northeastern U.S./eastern Canada, U.S. Pacific Northwest, and southeastern U.S.

Clearly, the new mills (which will constitute more than half of the total market for ONP by 1995) will have to source much of their ONP from suppliers hundreds of miles from the mills. State and regional recycling coordinators, large paper dealers, and mill sourcing authorities will probably all participate in developing the required new marketing channels.

U.S. AND CANADIAN MARKETS FOR OMG. The growth trend in OMG through 1995 appears similar to ONP; however, on close inspection, both the supply and the demand situations for OMG are considerably more complex than for ONP. For instance, the lack of a consensus definition of OMG complicates matters.

In 1991, 88 mills in the U.S. and Canada consumed less than 0.5 million tons of OMG in total (see Table 2). Nine of these mills consumed 30,000 tpy or more of OMG, accounting for more than half of the total 1991 demand. The remaining 79 mills, mostly the same board mills that are the low-volume consumers of ONP, each averaged only about 2,500 tpy of OMG. Consumption of OMG is projected to increase from 0.4 million tons in 1991 to 1.1 million tons in 1993 and to 1.9 million tons in 1995. All of the increase will come from mills consuming 30,000 tpy or more.

Most of the new large consumers of OMG are newsprint mills, which use OMG in conjunction with ONP in deinking processes now being installed. These processes reportedly require an optimum OMG to ONP ratio of 30%:70%. The "natural" overall composition of the U.S. home disposition stream is very close to this ratio, and, therefore, most existing or planned curbside OMG collection programs will collect the OMG commingled with ONP, said AIA.

Collecting OMG commingled with ONP is the ideal way to increase curbside collections by 40% with minimum additional cost or inconvenience. However, AIA lists some potential drawbacks to supplying the OMG commingled with ONP:

- Many ONP deinking facilities are working toward reducing the desired OMG to ONP ratio because the clay content of OMG is, in itself, a disposal problem. If a mill prefers to use an OMG to ONP ratio lower than 30%:70%, commingled OMG/ONP will be a problem.
- Even mills using OMG and ONP in the 30%:70% ratio may prefer to receive the two components separately because they wish to use different deinking process conditions for the ONP and the OMG.
- Four large existing recycled newsprint mills require

ONP free of OMG. ONP with commingled OMG will continue to be excluded from this market.

- Nine of the 36 major OMG-consuming mills projected for 1995 will be making products other than newsprint, principally groundwood specialties (such as directory paper) and market pulp. In most cases, these mills will be using an OMG to ONP ratio of about 50%:50% and, therefore, will have to blend separate streams of ONP and OMG or add OMG from another source to commingled OMG/ONP.

Mills that require OMG are not limited to sourcing from municipal curbside collections. A relatively clean, convenient source of "pure" OMG is available: magazine newsstand returns. Newsstand returns, plus pre-consumer waste, supply virtually all the OMG presently used and can supply about half of the OMG required by 1995. OMG collected in municipal curbside programs will, in effect, compete with newsstand returns and pre-consumer waste in many applications for OMG. In order to market OMG collected in curbside programs, municipal recyclers may have to consider supplying at least a portion of the OMG free of ONP, either by separating after collecting commingled ONP/OMG, or collecting and handling the OMG and ONP separately from source to delivery.

Future OMG-consuming facilities will be even more concentrated geographically than the ONP-consuming facilities. They will have to secure supplies from considerable distances; thus, they will prefer OMG which is not commingled with ONP, particularly newsstand returns. As in the case of ONP, marketing OMG to distant mills will probably require state and regional recycling coordinators, large paper dealers, and mill sourcing authorities to cooperate in developing new marketing channels.

U.S. AND CANADIAN MARKETS FOR OCC. In contrast to the markets for ONP and OMG, the market for old corrugated containers (OCC) is relatively mature and quite diversified geographically, and it operates virtually without municipal collection programs or recycling incentives. U.S. and Canadian OCC consumption is projected to increase steadily from 12.0 million tons in 1991 to 15.4 million tons in 1995 (see Table 3). Taking into account exports, the respective overall recovery rates are 55% in 1991 and 67% in 1995.

In 1991, 226 mills in the U.S. and Canada consumed OCC, and 54 of these used 75,000 tpy or more of OCC. The projected increase of about 3.4 million tons of OCC consumption between 1991 and 1995 will be accounted for primarily by the startup of 12 major new recycling facilities during that period, plus incremental increases in consumption by existing facilities. About 98% of recycled OCC is used to make containerboard and other recycled board products.

Existing OCC-consuming mills are geographically well diversified. Supply and transport systems are well established, and mills generally draw from relatively short distances. This situation will change, to some extent, by 1995 with a major increase in OCC recycling capacity in

the U.S. Southeast, which will draw large shipments of OCC from other regions.

Because the projected 67% recovery rate in 1995 will apparently approach the theoretical "maximum" rate (estimated at 70% to 75%), it is uncertain if municipal or state recycling coordinators should initiate or mandate additional OCC recovery programs. Experiences with municipal residential curbside or drop-off recovery programs for OCC to date have been less than satisfactory, and ample reasons suggest that collecting OCC from residential sources will not produce significant additional supplies in the foreseeable future.

The only significant underutilized sources of OCC are the relatively small retail/commercial establishments, according to AIA. These sources will eventually be tapped by commercial recyclers in the event of regional shortages of OCC. AIA believes that municipal recycling coordinators could assist or accelerate the process by publicizing the OCC recycling opportunity as a cost savings for local retailers, and possibly by acting in a voluntary coordinating role between the generators and the haulers. No direct or mandatory involvement by public authorities in OCC recycling seems necessary.

U.S. AND CANADIAN MARKETS FOR OWP. The market for office wastepaper (OWP) is presently "confused" by a glut of material and no abatement in the growth of additional voluntary office recycling programs. A major problem in analyzing the market for OWP and projecting future demand is the fact that there are at least two distinct markets for OWP, distinguished by the quality of the recovered paper. AIA characterizes the markets as either high-quality OWP (used for printing/writing paper, tissue, and market pulp) or low-quality OWP (used for paperboard products and packaging materials).

In 1991, 248 mills in the U.S. and Canada were consuming OWP. Of this total, 32 large mills consumed 30,000 tpy or more of OWP, accounting for about half of the total. The remaining 216 smaller mills averaged about 10,000 tpy. Present and future mills consuming OWP are relatively well dispersed geographically.

Low-quality OWP accounts for a little less than half of OWP consumption at present and is projected to increase very slowly through 1995. Because OWP in this market can be displaced by other grades of mixed wastepaper—or even by ONP—low-quality OWP use could actually decrease in the future if there were changes in the relative costs of the various grades of low-quality recycled paper. Low-quality applications clearly are not the best use for paper that can be recovered from offices.

The market for high-quality OWP, however, will remain almost constant through 1993 and then will more than double between 1993 and 1995 due to construction of 12 large new deinking facilities (tissue, printing/writing paper, and market pulp) and major expansions at several existing deinking facilities. Until the new deinking facilities are operating, though, demand for high-quality OWP will be limited by deinking capacity, inde-

TABLE 2: North American markets for old magazines.

	1991	1993	1995
Total consumption (000,000 metric tons)	0.4	1.1	1.9
Number of OMG-consuming mills:			
U.S.	78	82	94
Canada	10	18	21
Total	88	99	115
Number of mills consuming 30,000 tpy or more of OMG:			
U.S.	6	10	22
Canada	3	9	14
Total	9	19	36

Source: Andover International Associates.

TABLE 3: North American markets for old corrugated containers.

	1991	1993	1995
Total consumption (000,000 metric tons)	12.0	13.5	15.4
Number of OCC-consuming mills:			
U.S.	205	209	217
Canada	21	21	21
Total	226	230	238
Number of mills consuming 75,000 tpy or more of OCC:			
U.S.	46	50	58
Canada	6	8	8
Total	54	58	66

Source: Andover International Associates.

pendent of the success of attempts to create a market for printing/writing paper containing postconsumer recovered fiber.

Through 1993, the entire requirement for high-quality OWP can be supplied by preconsumer waste. Consequently, no net present demand exists for the OWP being collected rather laboriously at in-office segregation programs. This situation will persist until 1995, at which time the demand for high-quality recycled printing/writing paper will significantly exceed the supply of preconsumer waste, and a firm market for high-quality OWP will develop, according to AIA.

Because OWP is collected by commercial haulers rather than by municipal curbside collections, municipal recycling authorities have no direct involvement in whether collected paper is recycled or dumped. Even active attempts by recycling authorities to promote recycling at this time have a more symbolic than real effect due to the fact that OWP demand will not develop until new deinking capacity is installed.

However, when a significant market for high-quality OWP develops, municipal and state recycling coordinators can play a useful role in matching the quality of OWP collected to the requirements of the consuming mills. For a number of reasons, coordinating supplier and consumer will be more difficult with high-quality OWP than with other grades of wastepaper:

- The actual specification requirements for high-quality OWP will depend upon the end product for

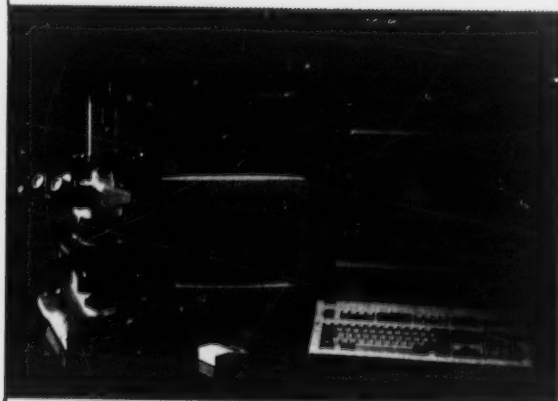
Ink Check

Deinking Analyzer

- Measures Ink in Recycled Fiber Handsheets
- Ink Particle Size Analysis down to 1 um size
- Analyzes up to 1,000 particles / second
- Deinking Efficiency Data Analysis Spreadsheet

Other applications include:

Stickies
Dirt counts.
Printability Test.
Mottle Measurement.



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which it is intended. Acceptable and unacceptable constituents of high-quality OWP will differ for the printing/writing paper, tissue, and market pulp applications. Even within any one of these end uses, the specific requirements will depend upon individual mill needs (the quality of paper produced and the exact nature of the deinking process).

• To deliver a grade of high-quality OWP specific to mill requirements, it is much more economical to collect recycled paper in the quality required (source segregated) than to collect with undesirables and subsequently sort.

• A single large OWP-consuming mill (100,000 tpy of OWP, for example) will need to draw its supply from a number of large municipalities. Assuming 40% recovery of OWP—a relatively optimistic projection—the complete OWP recovery from municipal areas totaling almost 5 million population will be required to supply a single large mill, according to AIA.

When significant quantities of high-quality OWP are required, it will be a formidable task to coordinate in-office recycling programs and the collection of OWP by commercial haulers from several large municipalities to reliably deliver uniform quality OWP to the mills. Clearly, municipal, state, and regional recycling coordinators will play an important role in facilitating this process.

IMPACT OF PAPER RECYCLING ON MSW. The consumption of recycled paper by U.S. and Canadian mills will increase by about 11.4 million tons from 1991 to 1995. Because paper consumption in North America is projected to increase by about the same amount over that time period, no significant change will occur in the quantity of wastepaper disposed of in municipal solid waste (MSW).

Public authorities planning future incinerator and landfill facilities must take into account the projected leveling of the wastepaper load in MSW, rather than assuming that it will continue to increase as in the recent past. We have already had reports of municipal incinerators starved for fuel and municipal landfill fees dropping as a result of implementation of paper recycling programs. An increase in consequences of this type in the future are to be expected as the market for recycled paper increases dramatically. In particular, the planning for new incineration capacity should take into account the reduced fraction of wastepaper in MSW, which we can confidently project from the repulping and deinking capacity now in the pipeline, according to AIA. ■

TABLE 4: North American markets for office wastepaper.

	1991	1993	1995
Total consumption (000,000 metric tons)	3.8	4.3	7.3
High quality	2.1	2.5	5.2
Low quality	1.7	1.8	2.1
Number of OWP-consuming mills:			
U.S.	222	226	236
Canada	26	26	28
Total	248	254	266
Number of mills consuming 30,000 tpy or more of OWP:			
U.S.	27	33	43
Canada	5	5	7
Total	32	38	50

Source: Andover International Associates.

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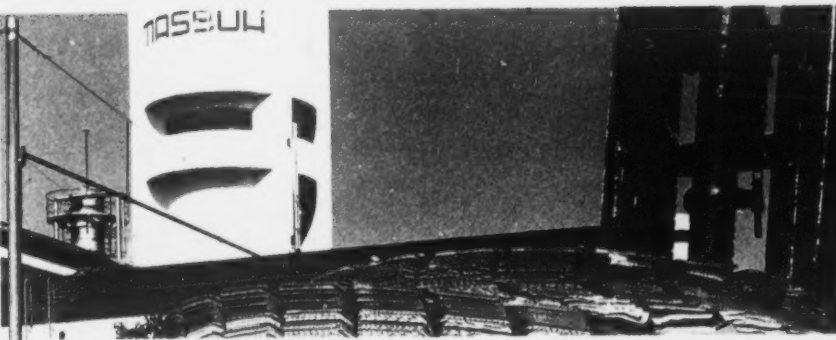
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Massuh's Quilmes mill in Argentina can produce up to 180 a.d. tpd of bleached semichemical pulp (BSCP) from eucalyptus species. (Staff photo by executive editor Jim Young.)



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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. **Subscriptions & Address Change:** Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean, US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00, 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photo-



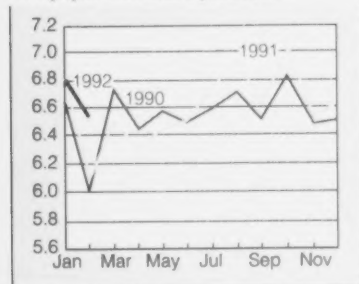
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A United Newspapers publication



U.S. paper and board production



U.S. production of paper and paperboard totaled 6.5 million tons in January, up 6.5% from the same month last year, according to the American Paper Institute. The extra leap-year day accounted for 1.8% of the increase, however. The seasonally adjusted rate of paper production was up just 0.1% from a year ago, but paperboard posted an increase of 2.1%.

Among major grades, newsprint production continued to lead the way with a 6.4% gain over last February. Imports took the full brunt of the decline in domestic demand last year, API reports, while U.S. exports have soared, particularly to Latin American markets. Printing and writing papers were off slightly from last year but were down 3.4% from the full-year average for 1991. February was another strong month for containerboard, with production for domestic use up 4.8% on the strength of a 5.7% increase in fiber box shipments for the first two months of the year.

Canadian newsprint shipments totaled 660,000 metric tons in February, down 4.1% from February 1991. Woodpulp shipments climbed 13.2% to 780,000 tons. Operating rates stood at 84% for newsprint mills, down from 97% a year earlier, and 93% for pulp plants, down from 98% in February 1991.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Feb.	561	7.5	7,009	6.4
Uncoated groundwood (s)	Feb.	116	-12.8	1,461	-15.3
Coated paper (s)	Feb.	597	5.9	7,167	-0.3
Uncoated free-sheet (s)	Feb.	954	12.0	11,533	4.6
Other printing/writing	Feb.	111	-6.7	1,402	-6.4
Total packaging and other paper (s)	Feb.	379	5.3	4,687	1.7
Tissue	Feb.	466	1.5	5,673	0.1
Total paper	Feb.	3,183	5.8	38,933	1.8
Unbleached kraft paperboard	Feb.	1,773	9.2	21,686	4.8
Semichemical medium	Feb.	478	5.5	5,900	3.4
Bleached paperboard	Feb.	351	-2.2	4,296	-4.6
Recycled paperboard	Feb.	750	8.7	9,295	6.3
Total paperboard	Feb.	3,353	7.3	41,178	3.9

Total U.S. paper and paperboard output	Feb.	6,536	6.5	80,111	2.9
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Feb.	5,254	4.4	65,614	3.0
Market pulp production	Feb.	820	8.3	9,997	10.2
Wastepaper consumption at paper/board mills	Feb.	1,912	14.6	23,639	8.6
Pulpwood consumption (cords)	Jan.	8,626	-2.0	103,512	-2.0

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Feb.	25,532	5.8	54,474*	5.7
Containerboard inventories at U.S. box plants and mills	Jan. 31	2,982	-3.6		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Jan.	937	-15.3	11,241	-15.3
Imports of Canadian newsprint	Jan.	540	-22.1	6,485*	-22.1
U.S. paper exports (including products)	Jan.	745	15.3	8,939	15.2
Exports of unbleached kraft linerboard	Jan.	267	6.8	3,209	6.8
Exports of woodpulp	Feb.	527	8.7	6,555	13.7
Norscan pulp inventories ⁴	Feb. 28	1,397	-12.4		
Norscan pulp operating rates ⁴	Feb.	94%	97%	85%	96%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Feb.	660	-4.1	1,323*	-9.0
Operating rates	Feb.	84%	97%	82%	96%
Inventories held by U.S. consumers	Feb. 28	1,322	-7.6		
Other paper/board shipments	Feb.	610	7.2	1,228	4.0
Woodpulp shipments (export only)	Feb.	780	13.2	1,472	6.7
Operating rates	Feb.	93%	98%	91%	95%

1. American Paper Institute. 2. API. Bureau of Census. American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Recycled paperboard: Consumer demand for recycled packaging gives boost to mills

Grade structure: Recycled paperboard is made from recovered wastepaper and is generally produced on a cylinder paper machine. It is a multi-ply material which can be manufactured in various weights and calipers. The most important grades are folding boxboard, corrugating medium, linerboard, gypsum wallboard, core/can/tube stock, and chipboard.

Markets: Industry capacity is distributed as follows: folding boxboard, 27.0%; corrugating medium, 21.2%; gypsum wallboard, 12.8%; linerboard, 8.0%; setup boxboard, 3.1%; core/can/tube stock and other converting grades 27.9%.

Production/capacity: Recycled paperboard production increased by 2.4% to 9.173 million short tons in 1991. Production in early 1992 continued a strong upward trend, with first-quarter production 7% higher than a year ago. The strongest gains in the first quarter were in recycled linerboard, gypsum wallboard, and tube, can, and drum stock. Total production for the year is forecast to rise by approximately 3%, increasing to 9.466 million tons.

Capacity to produce all grades of recycled paperboard is projected to increase at an annual rate of 3.5% during the three-year period of 1992-1994, according to the American Paper Institute. Containerboard grades (linerboard and corrugating medium) will account for 95%, or 1.086 million tons, of the capacity additions.

The largest capacity additions will come from Stone Container Corp. and Inland Container Corp., who will add approximately 740,000 tons of recycled containerboard capacity this year. Stone is converting an existing kraft linerboard mill in Jacksonville, Fla., to produce about 530,000 tpy of 100% recycled containerboard, and Inland Container is building a new greenfield mill in Maysville, Ky., to produce 210,000 tpy.

Outlook: Production of recycled paperboard will be paced by continued

steady demand for recycled folding cartons and the displacement of kraft linerboard and semichemical corrugating medium by the recycled containerboard grades. Manufacturers of corrugated boxes plan to use more recycled linerboard and corrugating medium to increase the amount of recycled fiber in their packaging. This trend has accelerated since the introduction of new box performance tests that permit mills to use more recycled fiber in their containerboard.

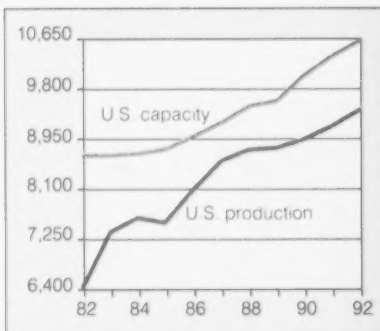
Consumer preference has played an important role in the increased use of recycled grades for folding cartons. The demand for recycled folding cartons should remain strong. In 1991, about 56% of folding cartons manufactured in the U.S. were made from recycled paperboard, up from 53% of the folding carton market in 1990.

Prices: Prices for most recycled paperboard grades strengthened during the first-half of 1992. Improving demand for construction and industrial packaging grades allowed mills to raise prices of uncoated grades about 6%, or \$20/ton. Containerboard grades have benefited from firmer prices for virgin kraft linerboard. A price hike for clay-coated folding carton grades is expected during the second-half of the year. The current benchmark price for 20-point clay-coated news back (CCNB), which is widely used in folding cartons, is \$535-\$545/ton.

Historical prices for clay-coated 20-point folding carton boxboard are (rolls, \$/short ton, year-end prices): 1980, \$380; 1981, \$400/425; 1982, \$380/425; 1983, \$370/425; 1984, \$375/425; 1985, \$350/400; 1986, \$380/420; 1987, \$390/415; 1988, \$465/\$475; 1989, \$490/\$500; 1990, \$535-\$545; 1991, \$535/\$545.

Bending 20-point chipboard prices are (rolls, \$/short ton, year-end prices): 1980, \$260/275; 1981, \$270/280; 1982, \$280; 1983, \$280/300; 1984, \$300; 1985, \$300; 1986, \$320; 1987, \$320; 1988, \$340/\$360; 1989, \$340/\$360; 1990, \$350/\$365; 1991, \$350/\$365.

SUPPLY/DEMAND (000 tons)



FORECAST (000 short tons)

	1990	1991	1992e
Production ¹	8,956	9,173	9,466
Capacity ¹	10,040	10,365	10,640
Utilization rate	89.2%	88.5%	89.0%
Imports	100	95	110
Exports	39	52	60
Apparent U.S. consumption	9017	9216	9516
lb/capita	72.14	72.95	74.78
GNP ratio ²	2.17	2.23	2.26

e = Pulp & Paper 1991 estimate.

1. American Paper Institute production, capacity data

2. 1,000 tons/\$ billion real GNP.

TOP U.S. PRODUCERS (000 tpy)

Company	Annual capacity (000 tons)	Market share (%)
1. Jefferson Smurfit Corp.	1,330	12.5
2. Newark Group Inc.	900	8.5
3. Sonoco Products Co.	900	8.5
4. Stone Container Corp. ¹	763	7.2
5. Inland Container Corp. ¹	620	5.8
6. Rock-Tenn Co.	607	5.7
7. Carstar Industries Inc.	565	5.3
8. Waldorf Corp.	395	3.7
9. U.S. Gypsum Co.	390	3.7
10. National Gypsum Co.	240	2.3
11. Packaging Corp. of America	280	2.6
12. Green Bay Packaging	210	2.0
13. Simkins Industries Inc.	205	1.9
13. Federal Paper Board Co.	200	1.9
14. James River Corp.	180	1.7

Market share of top five companies

42.5%

Market share of top ten companies

63.2%

1. Converted Seminole Kraft linerboard mill to 100% recycled furnish in 1992. 2. Does not include Maysville, Ky., linerboard mill under construction.

SALES AND EARNINGS

U.S. paper industry has mixed first quarter

The U.S. forest products industry reported mixed first-quarter earnings with strength in wood products offset by continued weakness in most paper grades. A *Pulp & Paper Week* survey of 28 companies showed earnings of \$513 million for the first quarter of 1992, excluding nonrecurring items, down 2.1% compared with year-ago results. Although heavy rains hampered production in the South, higher prices driven largely by tightening supplies caused by timber constraints led to dramatic improvements in the wood products sector, while a large number of paper producers continued to flounder.

Profits returned to Georgia-Pacific Corp.'s bottom line after a year's absence due to an all-time record quarter in its building products business, \$183 million vs \$6 million in first-quarter 1991. Operating profits at Weyerhaeuser Co.'s large wood products operations jumped nearly threefold to \$111 million and were instrumental in spurring an 81% jump in net income. Louisiana Pacific Corp. and Pope & Talbot Inc. were other firms returning to profitability on the strength of improved wood products results.

Yet, as the economy continued to drag, companies geared to printing and writing papers or newsprint fared horribly in first-quarter 1992. According to Boise Cascade Corp., prices for uncoated business and printing papers were at their lowest level in the last decade. And despite \$37 million in operating profits from its building products group, Boise Cascade again posted the largest deficit in the industry. At Bowater Inc., first-quarter sales rose 15% year to year, reflecting the inclusion of recently acquired Great Northern Paper Inc. But with prices for newsprint and groundwood publication businesses papers continuing to deteriorate, the company posted an \$18.8-million loss before special items in first-quarter 1992. Even the more diversified International Paper Co., hurt by depressed prices for printing and writing papers, suffered a 19% year-to-year decline in earnings before nonrecurring items. Results were basically flat relative to fourth-quarter 1991.

In other grades, tissue markets remained under pressure, although Kim-

U.S. paper/products industry results.

Companies	First-quarter 1992 (\$000)			
	Sales 1992	% change 1992/91	Earnings 1992	% change 1992/91
Boise Cascade Corp.	\$953,930	-3.9%	(\$42,860)	NM
Bowater Inc. ¹	372,836	14.9	(18,836)	NM
Champion International Corp. ¹	1,200,277	3.0	(16,569)	NM
Chesapeake Corp.	210,135	5.9	2,516	2.7%
Consolidated Papers Inc.	217,274	-5.4	15,396	-40.0
Federal Paperboard Co. Inc. ¹	323,000	-3.3	16,800	-32.0
Fort Howard Corp. ¹	276,266	1.2	(17,392)	NM
Georgia-Pacific Corp. ¹	2,830,000	1.9	5,000	NM
P.H. Glatfelter Co.	138,653	-7.0	14,932	-27.2
International Paper Co. ¹	3,356,000	8.4	104,000	-18.8
James River Corp. ¹	1,136,353	-2.8	(1,705)	NM
Kimberly-Clark Corp.	1,739,700	4.3	136,400	13.4
Longview Fibre Co. (1/92)	152,696	0.2	3,904	167.8
Louisiana-Pacific Corp.	475,500	31.2	36,000	NM
Mead Corp. ¹	1,088,200	-0.8	17,700	32.1
Mosinee Paper Corp.	52,301	5.7	(479)	NM
Pentair Inc.	292,834	1.3	8,717	18.2
Pope & Talbot Inc. ¹	127,142	-3.7	103	-95.2
Pottlatch Corp.	334,536	14.0	15,862	64.8
Scott Paper Co. ¹	1,200,100	1.8	36,344	24.0
Sonoco Products Co. ¹	429,793	5.4	22,753	23.9
Stone Container Corp.	1,354,300	1.3	(9,800)	NM
Temple Inland Inc. ¹	485,500	3.7	34,800	-17.3
Union Camp Corp. ¹	760,950	5.4	21,434	-48.0
Wausau Paper Mills Co. (2/92)	86,989	7.0	8,571	27.9
Westvaco Corp. (1/92) ¹	539,794	-5.9	27,104	-16.0
Weyerhaeuser Co. ¹	2,195,660	6.4	86,593	80.8
Willamette Industries Inc.	561,025	21.6	23,722	335.2
Totals	\$22,891,744	3.8%	\$531,010	-2.1%

1. Excludes major nonrecurring items.

() = losses. NM = not meaningful.

berly-Clark Corp. registered another impressive quarter as net income climbed 13.4% to \$136.4 million, equivalent to about one quarter of the entire paper and forest products industry's total earnings. Scott Paper Co. also turned in surprisingly strong results.

The profits at the major paperboard/packaging firms were improved relative to fourth-quarter 1991 but were, in most cases, still behind year-ago earnings. Looking ahead, packagers plan to raise prices for most products in the coming months and are hopeful that better times are just around the corner. At Stone Container Corp., for instance, the exposure to newsprint overshadowed its packaging businesses, and the company posted a \$9.8-million loss for the first three months of 1992, compared with a \$1.3-million profit in the year-ago period. ■

COATED PAPER

New pulp and paper mill in Alberta

Announced in early April, a new company, Grande Alberta Paper Ltd., has been formed with the intention of building a new pulp and paper mill near Grande Prairie, Alta. The project includes a lumber sawmill near Manning in northern Alberta, plus a greenfield chemi-thermomechanical pulp (CTMP) and lightweight coated (LWC) paper mill east of Grande Prairie on the Smoky River. The C\$2.3-billion project is headed by a new partnership that includes former executives from Weyerhaeuser Co. and one of the principles of the engineering company NLK. Startup of the first of three paper machines is scheduled for late 1995, with expected capacity of 300,000 metric tpy.

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Kenaf is grown in a Mississippi project with an eye toward papermaking

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A new chip thickness screen installed at Mead Corp.'s Chillicothe, Ohio, mill is improving screening efficiency and reducing screen wear

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James River's Groveton, N.H., fine paper mill reduced core costs by replacing shaftless core chucks with torque-activated chucks

THE COVER

The woodyard focus for this issue includes a look at the latest advancements in chip thickness screening (p. 93), which are already in use at Mead's Chillicothe, Ohio, mill. Other woodyard features include an update on the use of kenaf as it moves closer to commercial application and an in-depth profile of Alabama River Woodlands, the procurement arm of Parsons & Whittemore's Claiborne complex. (Photo courtesy of Rader Companies.)

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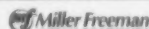
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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined Paper Mill News, Paper Trade Journal and Pacific Pulp & Paper, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean, US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. Send subscription correspondence to: Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.



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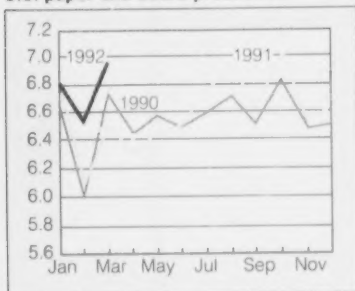
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MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 7.0 million tons in March, up 6.1% from the same month last year, according to the American Paper Institute. Production in the first quarter was up 2.8% on a seasonally adjusted basis. Paperboard output in March matched the record December 1991 pace, leading to a gain of 4.2% for the quarter compared with the same period last year. Paper production posted a more modest 1.3% gain despite a 4.8% increase in newsprint output and strengthening in printing and writing demand.

Among major grades, printing and writing papers were up 2.5% for the first quarter, although 1% of the gain was due to an extra day for leap year. Uncoated free-sheet recorded the strongest performance, rising 6.4% through March. Containerboard production was up 6.3%, with a 7.3% increase in output for the domestic market offsetting a decrease of 0.6% in production for export.

Canadian newsprint shipments totaled 737,000 metric tons in March, down 0.8% from March 1991. Woodpulp shipments climbed 18.8% to 784,000 tons. Operating rates stood at 81% for newsprint mills, down from 87% a year earlier, and 90% for pulp mills, up from 83% in March 1991.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Mar.	586	1.7	7,017	4.8
Uncoated groundwood (s)	Mar.	133	-10.1	1,506	-14.3
Coated paper (s)	Mar.	608	3.4	7,243	1.4
Uncoated free-sheet (s)	Mar.	993	10.2	11,674	6.4
Other printing/writing	Mar.	133	-2.9	1,468	-5.2
Total packaging and other paper (s)	Mar.	404	4.4	4,743	1.8
Tissue	Mar.	502	-0.6	5,789	-0.2
Total paper	Mar.	3,358	3.5	39,441	2.4
Unbleached kraft paperboard	Mar.	1,889	11.1	22,007	6.7
Semichemical medium	Mar.	490	4.5	5,895	3.8
Bleached paperboard	Mar.	400	2.6	4,476	-1.7
Recycled paperboard	Mar.	833	8.6	9,590	5.9
Total paperboard	Mar.	3,612	8.6	41,987	5.4

Total U.S. paper and paperboard output	Mar.	6,970	6.1	81,408	3.9
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Mar.	5,525	3.9	65,844	3.2
Market pulp production	Mar.	863	16.2	10,119	12.1
Wastepaper consumption at paper/board mills	Mar.	2,110	16.2	24,206	10.1
Pulpwood consumption (cords)	Feb.	8,626	6.3	103,612	-2.0

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Mar.	27,730	13.2	82,151 ⁴	8.0
Containerboard inventories at U.S. box plants and mills	Feb. 28	3,033	-1.3		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Feb.	933	-7.4	11,214	-11.5
Imports of Canadian newsprint	Feb.	542	-15.0	6,496 ⁴	-18.7
U.S. paper exports (including products)	Feb.	494	-23.2	8,698	11.1
Exports of unbleached kraft linerboard	Feb.	246	1.2	3,083	4.1
Exports of woodpulp	Mar.	576	-4.0	6,918	10.8
Norscan pulp inventories ⁴	Mar. 31	1,227	-23.5		
Norscan pulp operating rates ⁴	Mar.	95%	94%	97%	95%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Mar.	737	-0.8	2,793 ⁶	-5.5
Operating rates	Mar.	81%	87%	81%	92%
Inventories held by U.S. consumers	Mar. 31	n.a.			
Other paper/board shipments	Mar.	645	5.6	2,556	6.9
Woodpulp shipments (export only)	Mar.	784	18.8	3,127	13.2
Operating rates	Mar.	90%	83%	91%	91%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Bleached paperboard: Mill operating rates are improving after a turbulent business cycle

Grade structure: Solid bleached sulfate (SBS) paperboard is used primarily for folding carton and milk carton packaging. SBS is a premium paperboard grade produced from a furnish containing at least 80% virgin-bleached woodpulp. It is intended for applications that require superior folding, scoring, and printing characteristics. It is also used for cups and plates, food containers, and preprint linerboard used in display packaging. Most SBS is clay-coated for printing applications and may also be polyethylene-coated for food packaging. Basis weights vary from 40 to 100 lb/1,000 ft², and calipers range from 12 to 28 pt.

Markets: Industry capacity for bleached paperboard is distributed as follows: folding boxboard, 49.3%; milk carton and food service, 41.2%; linerboard, 3.6%; and other packaging, 5.9%. These figures represent the 1992 capacity allocations published by the American Paper Institute.

Production/capacity: Bleached paperboard output increased by 3.9% to 4.572 million short tons in 1991 as a result of an expansion in industry capacity. However, market conditions weakened toward the end of the year, and demand dropped considerably. Despite the upward trend in industry production, actual consumption probably declined slightly during the year. Domestic demand remained weak in January and February, so a considerable inventory surplus accumulated at paper mills.

During 1991, the bleached paperboard industry added 180,000 tons of new capacity, representing a gain of 3.8% to 4.886 million tons. This year, mills will add an additional 81,000 tons of capacity to raise the industry capacity base to 4.967 million tons. Capacity will remain at approximately this level until late 1993, when Westvaco Corp. is scheduled to bring on-line a new paper machine with capacity of 350,000 tons/year.

Several mills that produce SBS packaging board also manufacture lightweight bleached bristols used by commercial printers for paperback book covers, telephone directories, greeting cards, menus, postcards, etc. In 1991, bleached Bristol production

declined by 2.5% to 1.123 million tons. Bleached bristols are not included in the bleached packaging board capacity and production figures shown here.

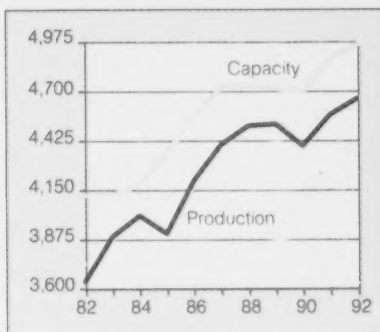
Outlook: Bleached paperboard markets showed renewed strength in May and June of 1992 and mill backlogs improved steadily through midyear. Production of folding carton grades bounced back after dropping to a seven-year low point in February, but total production during the first half of the year remained about 6% below production levels for the same period in 1991. Production of milk carton stock for domestic plants also remained lower due to excess inventory early in the year, but exports were up about 10%.

Most of the excess inventory of bleached paperboard was removed by midyear, therefore setting the scene for a recovery to more stable market conditions. Exports will lead the recovery, but due to the continued weakness in the U.S. economy, total bleached paperboard production is forecast to increase only 2% above the 1991 level this year. Since SBS capacity will increase about 1.5% this year, supply and demand should be fairly balanced.

Prices: Bleached paperboard prices were under considerable pressure during the past year. This resulted in widespread price discounting in a number of grades including uncoated plate and cup stock and some of the commodity folding carton grades. Although nominal list prices of lightweight folding carton grades increased about \$40/ton to \$870 in mid-1991, transaction prices for many customers were closer to \$800-\$830/ton, with some low-end business down at \$750-\$780/ton. Current prices have now stabilized and most transactions are at the \$800-\$850 level. Even among the lower quality grades, prices are up from the depressed \$750-\$760 level of a year ago.

Historical prices for solid bleached, clay-coated 15-pt folding carton boxboard (rolls, \$/short ton, year-end prices): 1980, \$550; 1981, \$625; 1982, \$590/625; 1983, \$590/625; 1984, \$590/665; 1985, \$500/590; 1986, \$580/590; 1987, \$635; 1988, \$730; 1989, \$830; 1990, \$830; 1991, \$800. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990	1991	1992
Production ¹	4,399	4,572	4,663e
Capacity ¹	4,706	4,886	4,967
Utilization rate	93.5%	93.6%	93.9%
Imports	40	30	30
Exports	732	743	790
Apparent U.S. consumption	3,707	3,859	3,903
lb/capita	29.7	30.5	30.6
GNP ratio ²	0.89	0.93	0.93

1. American Paper Institute production, capacity data. 2. 1,000 tons/\$ billion real GNP. e = Pulp & Paper estimate.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity (000 tons)	Market share (%)
1. International Paper	970	19.5
2. Federal Paper Board	680	13.7
3. Westvaco	620	12.5
4. Potlatch	554	11.2
5. Georgia-Pacific	370	7.5
6. Temple-Inland	300	6.0
7. James River	270	5.4
8. Champion International	265	5.3
9. Gulf States Paper	230	4.6
10. Weyerhaeuser	230	4.6
11. Gilman Paper	200	4.0
12. Jefferson-Smurfitt/CCA	185	3.7
13. Union Camp ¹	140	n.a.

Market share of top five companies: **64.4%**

Market share of top ten companies: **90.3%**

Total U.S. capacity (1992): **4.967 million short tons**

1. Includes more than 50% board/bristol swing capacity. n.a. = not available.

also said the company's 440,000-tpy Lufkin, Texas, mill is using a "direct entry" method of recycling, producing a low-content recycled sheet without the deinking process.

Sheldon will begin collecting and building up storage of wastepaper in the fall. Curbside collection in Houston now produces 500 tons/month, involving about 48,000 homes, with plans to add 60,000 more homes this year. The Sheldon mill, located about

20 minutes from downtown Houston, will consume approximately 500 tons/day of ONP and old magazines, and the company said it hopes to collect the remaining one-third of its needs from elsewhere in Texas, boosting the state's total recyclable recovery rate from 17% to 30%. The mill will divert some of the flow of Texas wastepaper to recycled paper/board mills in Monterrey and San Luis Potosi, Mexico. ■

However, demand from offshore lumber markets remains weak, particularly in Japan. And of potentially even greater concern, Canadian producers may suffer an erosion in their competitive position unless a preliminary ruling by the U.S. Dept. of Commerce is overturned in the near future; the ruling imposed a 14.48% countervailing duty on all Canadian lumber imported into the U.S., effective early March.

Despite the upturn in the lumber markets, both Fletcher Challenge Canada Ltd. and MacMillan Bloedel Ltd. in British Columbia fell well shy of break-even. After suffering a steep \$24.4-million first-quarter loss, FC announced plans to issue almost \$250 million in additional equity, 71.6% of which is to be purchased by its parent company, Fletcher Challenge Ltd. of New Zealand.

Proceeds will be used to repay debt. The company has agreed to sell its Crown Packaging corrugated container business to United Packaging Ltd. of Richmond, B.C., which will also purchase Crown's 50% interest in Commencement Bay Corrugated Inc. near Tacoma, Wash.

MB reported a net loss of \$11 million for the first three months of 1992, compared with a \$36.4-million loss in fourth-quarter 1991 and a \$3.8-million gain in first-quarter 1991. MB noted that equity earnings declined mainly because Dutch papermaker KNP, of which MacMillan Bloedel owns a 31% equity interest, is experiencing weaker paper markets in Europe. MB's management doesn't expect a significant improvement in pulp or newsprint until sometime in 1993.

Toronto, Ont.-based Abitibi-Price Inc.'s \$41.6-million first-quarter loss can be largely tied to low prices and significant downtime at its newsprint operations. The newsprint segment's sales tumbled 25% to \$184 million, while its quarterly operating loss exceeded \$33 million compared with a \$2.2-million loss a year earlier. Profits may remain under considerable pressure in light of faltering prospects for a 5% reduction in newsprint discounts, which certain companies, not including Abitibi, had announced for summer.

Results at Canadian Pacific Forest Products Ltd. of Montreal were even worse as lower newsprint pricing and shipment volumes overwhelmed relief from improved lumber prices. ■

SALES AND EARNINGS

Canadian industry losses narrowed

Canadian paper industry results.

	First-quarter 1992 (C\$000)			
	Sales 1992	% change 1992/91	Earnings 1992	Earnings 1991
Abitibi-Price Inc.	\$650,000	-10.5%	(\$41,600)	(\$5,500)
Canadian Pacific Forest Products Ltd. ¹	429,700	(12.0)	(71,100)	(52,500)
Canfor Corp. ¹	215,700	1.0	(10,900)	(16,500)
Cascades Inc. ¹	213,391	(2.0)	5,419	5,571
Crestbrook Forest Industries Ltd.	38,981	3.4	(2,527)	(2,483)
Doman Industries Ltd. ¹	121,700	(1.1)	(6,800)	(10,100)
Domtar Inc.	450,000	0.0	(46,000)	(28,000)
Donohue Inc. ¹	113,763	(13.3)	(8,300)	2,331
Fletcher Challenge Canada Ltd.	229,800	(13.8)	(24,300)	(10,700)
MacMillan Bloedel Ltd.	718,500	6.0	(11,000)	3,800
Noranda Forest Inc.	1,051,000	2.0	(24,000)	(38,000)
Repap Enterprises Corp.	278,300	1.5	(44,600)	(17,500)
Rolland Inc.	68,200	(19.5)	(2,023)	313
Scott Paper Ltd.	98,212	(16.9)	1,375	4,696
Slocan Forest Products Ltd.	56,727	42.0	83	(4,116)
Tembec Inc. ¹	82,249	38.4	(8,850)	417
Weldwood of Canada Ltd.	180,400	13.5	1,500	(7,500)
West Fraser Timber Co.	154,000	51.9	2,000	(8,200)
Totals²	\$4,432,123	-2.0%	(\$286,123)	(\$185,871)

1. 1992 earnings exclude major nonrecurring items.
 2. Totals. Noranda Forest accounts for MacMillan Bloedel, in which it has roughly a 50% stake, as a consolidated subsidiary. Accordingly, to avoid double counting, MB's sales and half of its earnings are excluded from the totals line.
 () = losses.

The prolonged slide in the Canadian forest products industry's profits appeared to be at least leveling off in the first three months of 1992, as strength in the wood products sector, benefits from restructuring efforts, and a weakening Canadian dollar offset a continued slump in most paper grades, particularly newsprint. A *Pulp & Paper Week* survey of 18 companies showed a net loss of C\$286.1 million, excluding nonrecurring items, on sales of \$4.4 billion for the quarter ending Mar. 31, 1992. Though down relative

to a \$185.9-million deficit posted in the same period a year earlier, the loss tally was less severe than those reported for the third and fourth quarters of 1991, \$324 million and \$419 million, respectively.

Wood products especially were showing signs of recovery in the first quarter. Bolstered by strong markets for lumber products and improved pricing for pulp, Weldwood of Canada Ltd., West Fraser Timber Co. Ltd., and Slocan Forest Products Ltd. all managed to return to the black.

PULP & PAPER

August 1992

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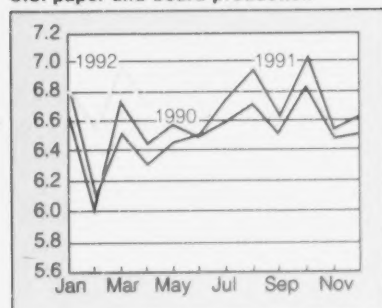
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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined Paper Mill News, Paper Trade Journal and Pacific Pulp & Paper, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean: US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. Send subscription correspondence to: Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2350. For address change, include label from recent issue.



MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.7 million tons in April, up 5.7% from the same month last year, the American Paper Institute reported in its latest monthly update. Production through April rose to a seasonally adjusted, annualized rate of 81.2 million tpy, up 4.4% from the same period in 1991. Paper output has grown steadily since the beginning of the year, with output through April up 1.8% from a year earlier after seasonal adjustments. Paperboard output was up 5.2% over the same period.

Among major grades, printing and writing papers and newsprint were largely responsible for the increase in the paper sector. Printing and writing shipments were up 3.1% through the first four months, led by a 6.6% gain for uncoated free-sheet. Containerboard production was up 7.0% through April, driven by continued strong fiber box shipments. Exports of paper and paperboard rose 8.7% in the first quarter, while imports were off by 7.5%.

Canadian newsprint shipments totaled 737,000 metric tons in April, down 0.8% from a year earlier, according to the Canadian Pulp & Paper Assn. Operating rates dropped to 81%. Woodpulp mills operated at 90%, and shipments rose 18.8% for the month to 784,000 tons.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Apr.	596	4.0	7,051	4.6
Uncoated groundwood (s)	Apr.	127	-8.0	1,513	-12.6
Coated paper (s)	Apr.	579	3.8	7,195	2.3
Uncoated free-sheet (s)	Apr.	972	6.2	11,697	6.6
Other printing/writing	Apr.	129	0.8	1,493	-2.5
Total packaging and other paper (s)	Apr.	390	1.8	4,725	1.5
Tissue	Apr.	470	-1.5	5,751	-0.5
Total paper	Apr.	3,261	2.8	39,425	2.6
Unbleached kraft paperboard	Apr.	1,777	11.4	21,770	7.4
Semichemical medium	Apr.	476	3.0	5,913	4.7
Bleached paperboard	Apr.	386	0.8	4,515	-1.1
Recycled paperboard	Apr.	799	9.9	9,589	7.5
Total paperboard	Apr.	3,437	8.5	41,786	6.0

Total U.S. paper and paperboard output	Apr.	6,698	5.7	81,211	4.4
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Apr.	5,489	3.9	65,851	3.4
Market pulp production	Apr.	837	6.9	10,100	10.8
Wastepaper consumption at paper/board mills	Apr.	2,003	14.2	24,173	10.1
Pulpwood consumption (cords)	Mar.	8,411	1.7	99,414	-0.6

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Apr.	29,178	4.1	111,365 ⁶	7.0
Containerboard inventories at U.S. box plants and mills	Mar. 31	3,075	2.4		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Mar.	998	1.0	11,470	-7.5
Imports of Canadian newsprint	Mar.	566	-9.3	6,595 ⁶	-15.7
U.S. paper exports (including products)	Mar.	759	5.1	8,767	9.0
Exports of unbleached kraft linerboard	Mar.	262	-9.0	3,103	-0.7
Exports of woodpulp	Apr.	622	17.8	7,463	19.1
Norscan pulp inventories ⁴	Apr. 30	1,239	-20.5		
Norscan pulp operating rates ⁴	Apr.	92%	95%	94%	95%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Apr.	737	-0.8	2,793 ⁶	-5.5
Operating rates	Apr.	81%	87%	81%	92%
Inventories held by U.S. consumers	Apr. 30	n.a.			
Other paper/board shipments	Apr.	645	5.6	2,556	6.9
Woodpulp shipments (export only)	Apr.	784	18.8	3,127	13.2
Operating rates	Apr.	90%	83%	91%	91%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Market pulp: Strike in British Columbia helps keep recovery in pulp market moving

Grade structure: Chemical paper-grade market pulp is sold in the open market and does not include captive pulp used onsite or shipped to affiliated mills within North America. Pulp is divided into grades based on whether it is made from softwood or hardwood fiber, produced by the sulfate (kraft) or sulfite pulping process, and by the amount of bleaching.

Northern bleached softwood kraft (NBSK) has traditionally been the premium pulp grade because of its long fiber length and strength, although recently southern pine and hardwood pulp have come close to it in price. U.S. pulp statistics include about 2 million tons of fluff pulp production used in diapers and other absorbent hygiene products. Dissolving and mechanical pulp grades are excluded from the statistics. Canada has about 1.64 million tons of mechanical pulp capacity—mainly bleached chemi-thermomechanical market pulp (BCTMP)—although three mills representing about 500,000 tons of capacity are currently idle.

Production/capacity: After declining for two years from the 1988 peak, world pulp shipments rebounded last year as customers began to rebuild inventories. Pulp shipments have remained strong through the first half of 1992 as the inventory restocking has continued in response to a series of price increases announced by producers beginning in the fall of 1991. From the low reached last fall, prices had advanced roughly \$80/ton by the second quarter of 1992. The price increase momentum appeared to be slowing by late spring, with customer inventories at fairly high levels and weakness persisting in U.S. and European printing/writing paper production.

However, a strike that began around June 15 in British Columbia appears likely to keep the market in balance through the remainder of the year. Pulp mills in the province account for about half of Canada's total market pulp capacity of 8.4 million metric tons and around 30% of total world softwood supply.

Because of the strike, Canadian pulp production is only forecast to be

up 3.5% for all of 1992. This would result in an industry operating rate of about 87% for 1992.

Market trends: NBSK pulp prices have been lagging behind other grades in the recent recovery, and Canadian producers were unable to push through their announced list price of \$580 for the second quarter. However, since the outbreak of the strike, Canadian producers have announced a \$600/metric ton price for NBSK for the third quarter and there will probably be another increase for the fourth quarter if the strike drags into August.

U.S. southern pine pulp producers were also encouraged to follow hardwood producers in announcing about a \$30/ton price increase for the third quarter. U.S. market pulp production is forecast to rise about 11% for all of 1992, with mills running at close to 91% of capacity.

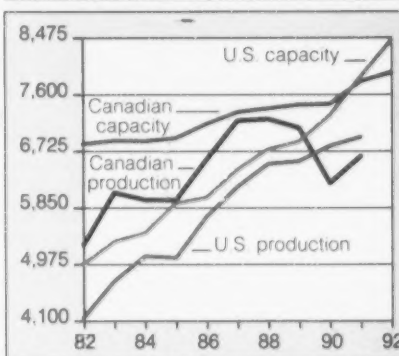
U.S. market pulp capacity is forecast to jump 7.1% this year, following an 8.2% jump in 1991 reflecting the startup of major expansions such as Weyerhaeuser Co. (Columbus, Miss.), Parsons & Whittemore Inc. (Alabama Pine Pulp Co.), and Stone Container Corp. (Savannah River Pulp & Paper Corp.).

Outlook: The pulp market is expected to continue a gradual recovery in 1993 as the world economy begins to pick up. However, capacity from new mills starting up in North America, Chile, and Brazil over the 1990-93 period will restrain the recovery in operating rates and prices.

Canadian pulp production is forecast to rise by at least 5%, reflecting a rebound from strike-depressed 1992 production levels. Canadian operating rates are expected to remain just below 90% as two major projects at Alberta-Pacific and Celgar Pulp Co. startup in 1993. After rising only 1.8% in 1991, Canadian capacity is expected to rise 2.4% in 1993 and 4.5% in 1994. U.S. production is forecast to rise slightly more than 3%.

Operating rates may be helped, however, by recent capacity closures, including Fraser Inc.'s Atholville, N.B., sulfite mill; Cascades Inc.'s Jonquiere, Que., kraft mill; and Weyerhaeuser's Everett, Wash., kraft mill. ■

SUPPLY/DEMAND (000 metric tons)



FORECAST (000 metric tons)

U.S.	1991	1992e	1993e
Production	6,945	7,700	7,910
U.S. capacity ¹	7,882	8,444	8,687
Utilization rate	88.1%	91.1%	91.1%
Imports	2,555	2,605	2,735
Exports	4,689	5,390	5,450
Apparent U.S. consumption	4,811	4,915	5,195
Canada			
Production	6,651	6,910	7,310
Capacity ¹	7,808	7,947	8,180
Utilization rate	85.2%	87.0%	89.4%

e = Pulp & Paper estimate.

1. Based on 1991 American Paper Institute and 1992 Canadian Pulp & Paper Assn. capacity surveys.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity (000 tons)	Market share (%)
1. Georgia-Pacific ^{1,2,4,5}	1,540	9.3
2. Weyerhaeuser ^{1,2,4,5}	1,400	8.5
3. Parsons & Whittemore ^{1,2}	1,110 ^a	6.8
4. Canadian-Pacific ^{1,2}	940	5.7
5. Champion International ^{1,2}	790a	4.8
6. Stone Container ^{1,2}	743b ^c	4.5
7. Canfor ^{1,2}	585c	3.6
8. Federal Paper Board ^{1,2}	560	3.4
9. Fletcher Challenge ¹	530 ^c	3.2
10. Repap ^{1,2}	480	2.9

Market share of top five companies:
35.3%

Market share of top ten companies:
52.9%

Total U.S. capacity (1992):
16.391 million short tons

1. Bleached softwood kraft. 2. Bleached hardwood kraft. 3. Unbleached kraft. 4. Bleached sulfite. 5. Fluff. 6. Includes major new capacity addition (which may not be fully operational). 7. Reflects recent capacity closure or sale.

Capacity shown on equity ownership basis.

a. Includes 84.6% of Weldwood, which owns 50% of Cariboo Pulp. b. Includes 25% of Celgar Pulp. c. Includes 50% of Howe Sound.

Producers Hope for Market Recovery as Pulp Prices, Production Increase

Market pulp output increases by modest 1.5% in 1991, and prices begin to climb; South American mills make major capacity additions

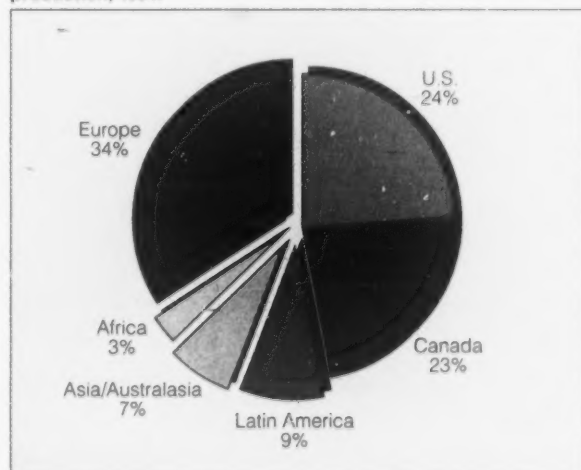
By KELLY H. FERGUSON, Deputy Editor

After almost two years on the decline, the worldwide market pulp market seems to be rebounding. Production and prices have begun to increase and overall capacity continues to grow at a nominal pace for most major grades, based on *Pulp & Paper International's* 1991 Market Pulp Survey and recent reports from *Pulp & Paper Week*.

World production of all market pulp grades increased a modest 1.5% to 34.5 million tons from 1990 to 1991, following an approximate 3% decline from 1989 to 1990.

Note: All figures in this article are in metric tons. *Pulp & Paper International's* 1991 Market Pulp Survey, a summary of which is published here, is an 80-page mill-by-mill listing of nearly 300 market pulp producers worldwide, covering production, capacity, export percentage, and brand names used. This survey is priced at \$677 and is available from *Pulp & Paper International* in Brussels, Belgium. Fax: (322) 537-5626. Telex: 24672 mfp b.

FIGURE 1: Geographic distribution of world market pulp production, 1991.



World market pulp capacity increased 1.6% from 1990, mostly due to projects coming online in Brazil, France, and Canada.

North America remains the dominant market pulp producer (Figure 1) with 47% of total production. And with the addition of 506,000 tons from Canada and 338,000 tons from the U.S. in the next three years, that position will be strengthened. A production shift is occurring among the other continents, however. Several European countries (Denmark, Norway, Sweden) experienced decreases in their market pulp capacity, causing Europe to drop to 34% from 37% in total production.

Gains in total production were made by Latin America, Asia/Australasia, and Africa. It is in these regions where significant capacity expansions are occurring, and these increases have begun to have a major effect on the market.

Brazil has surpassed Finland as the fourth largest market pulp producing country (Table 1), and its addition of 881,000 tons capacity in the next three years is more than the combined 844,000 tons of new capacity

TABLE 1: 1991 market pulp output for selected countries (000 metric tons).

	Sulfate	Sulfite	Mechanical	Semi-chemical	Non-wood	Recycled	Total
Canada	6,405	528	1,101	—	—	71	8,105
U.S.	6,953	1,012	6	—	165	47	8,183
Sweden	2,654	385	395	—	—	—	3,434
Finland	1,091	164	75	—	—	60	1,390
Norway	280	152	238	32	—	—	702
Brazil	1,901	25	8	49	—	—	1,983
Japan	787	187	—	40	—	—	1,014
Portugal	1,198	113	—	—	—	—	1,311
France	730	257	3	—	—	—	990
Spain	541	17	35	—	5	—	598
New Zealand	290	—	126	—	—	—	416
Chile	625	—	—	—	—	—	625
U.S.S.R.	990	250	—	—	—	—	1,240
Total	24,445	3,090	1,987	121	170	178	29,991
Total world	26,954	4,385	2,149	302	461	205	34,456

Note: Dissolving included in sulfate and sulfite. Fluff included in sulfate, sulfite, and CTMP. Recycled is mainly deinked grades.

TABLE 2: 1991 market pulp exports from major producers (000 metric tons).

Major importers	U.S.	Canada	Sweden	Finland	Norway	Brazil	Total
Europe	2,031	2,226	2,434	1,280	560	414	8,945
U.S.	—	3,718	31	8	—	331	4,088
Canada	207	—	7	—	—	3	217
Asia/Australasia	2,248	1,539	261	120	16	261	4,445
Latin America	448	116	—	2	—	19	585
Africa	118	4	36	5	6	1	170
World total	5,052	7,603	2,769	1,415	582	1,029	18,450

expected from the U.S. and Canada. Other countries also continue to expand their market pulp capacity, including Finland (485,000), France (110,000), Japan (286,000), Rep. Korea (160,000), Spain (123,000), Portugal (100,000), and Thailand (100,000).

As in years past, Canada remains the leading market pulp exporter (Table 2). A trend seen in last year's survey has continued, though: Canada decreased its exports by more than 620,000 tons, and Sweden cut back by more than 140,000 tons. The U.S. continued to increase its exports (up 230,000 tons), as did Brazil (up 140,000 tons).

Europe remains the major importer of market pulp (8.9 million tons), followed by Asia/Australasia (4.5 million tons) and the U.S. (4 million tons). However, Europe decreased its imports from 1990 levels (down 400,000 tons), as did Asia/Australasia (down 554,000 tons). The U.S., Canada, Latin America, and Africa increased their imports slightly from 1990.

HARDWOOD CONTINUES TO CLIMB. Bleached softwood kraft (BSK) is still the major market pulp grade

TABLE 3: 1991 market pulp output by grade and continent (000 metric tons).

Grade	Europe	North America	Latin America	Asia/Australasia	Africa	Total
BSK ¹	3,630	9,014	764	241	75	13,724
BHK ¹	4,203	3,152	1,789	983	171	10,298
UBK	549	564	401	429	160	2,103
Sulfite ²	1,872	542	23	26	—	2,463
Dissolving	325	1,626	15	350	435	2,751
Semichemical	213	—	—	40	—	253
SGW	371	45	—	—	—	416
RMP/CMP/TMP	149	192	—	10	—	351
CTMP	338	870	58	116	—	1,382
Nonwood	55	165	74	164	52	510
Recycled ³	87	118	—	—	—	205
World total	11,792	16,288	3,124	2,359	893	34,456

BSK = Bleached softwood kraft (sulfate). BHK = Bleached hardwood kraft (sulfate). UBK = Unbleached kraft (sulfate). SGW = Stone groundwood. RMP = Refiner-mechanical pulp. CMP = Chemimechanical pulp. TMP = Thermomechanical pulp. CTMP = Chemi-thermomechanical pulp.

1. Bleached and semibled. 2. Bleached and unbleached. 3. Mainly deinked grades. Note: Fluff included in sulfate, sulfite, and CTMP.

(Figure 2), but it is beginning to slip as other grades—particularly bleached hardwood kraft—make significant gains (Table 3). In the 1990 survey, BSK accounted for a little more than 40% of total market pulp production. In this year's survey, it accounts for 39.83%.

Meanwhile, bleached hardwood kraft (BHK) has gained almost a full percentage point, making up almost 30% of total market pulp output in 1991, compared with 28.53% in 1990. Also, BHK capacity increased 3.2% from 1990 to 1991, while BSK capacity increased only 0.6%. And the capacity gain is expected to continue—BHK producers are expected to add 1.78 million tons of capacity in the next three years, compared with 1.56 million tons for BSK.

Figure 3 shows the downward trend of the last three years for BSK and how BHK has gotten back on an upward track after a sluggish market in 1990. The other pulps shown in Figure 3 probably reflect the stagnant state of the market, with little change in production.

Several surprises also appeared in this year's survey. Unbleached kraft pulp, which had experienced a 27.9% production increase from 1989 to 1990, dropped 58.9% from 1990 to 1991. Capacities for most mechanical pulps increased from 1990 to 1991, especially chemi-thermo-mechanical pulp (up 13.2%). Production of mechanical pulps suffered though, due to the price drop for BSK and BHK.

As for market pulp prices, if the steep price plunge that began in mid-1990 mirrored the paper industry's downturn, then it is possible the industry is beginning to climb out of the economic dive. Prices for northern bleached softwood kraft (NBSK) in Northern Europe (US\$/ton) seemed to have hit bottom at \$500 and had reached a fairly firm \$540 in the second quarter of 1992 (Figure 4). According to *Pulp & Paper Week*, some major producers had already pushed through an increase to \$600/ton by early third-quarter.

FIGURE 2: Grade distribution of world market pulp production, 1991.

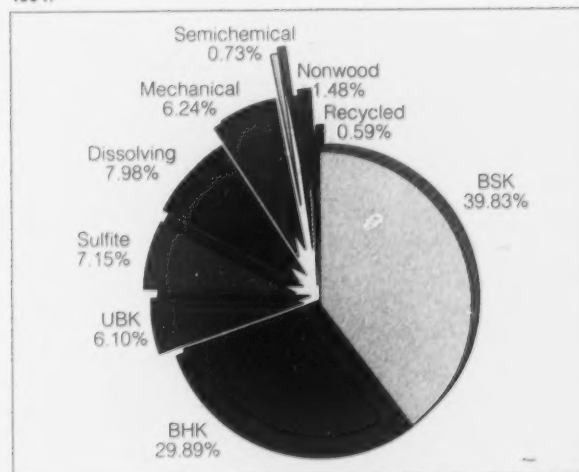


FIGURE 3: World market pulp output, 1989, 1990, and 1991.

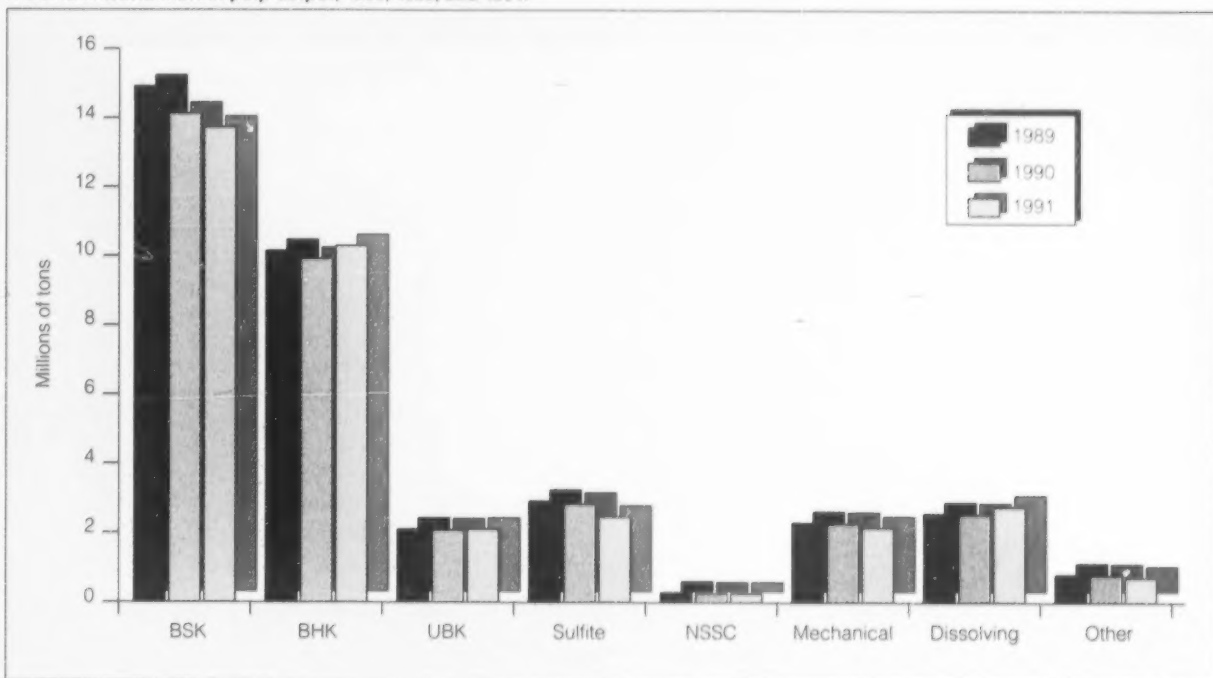
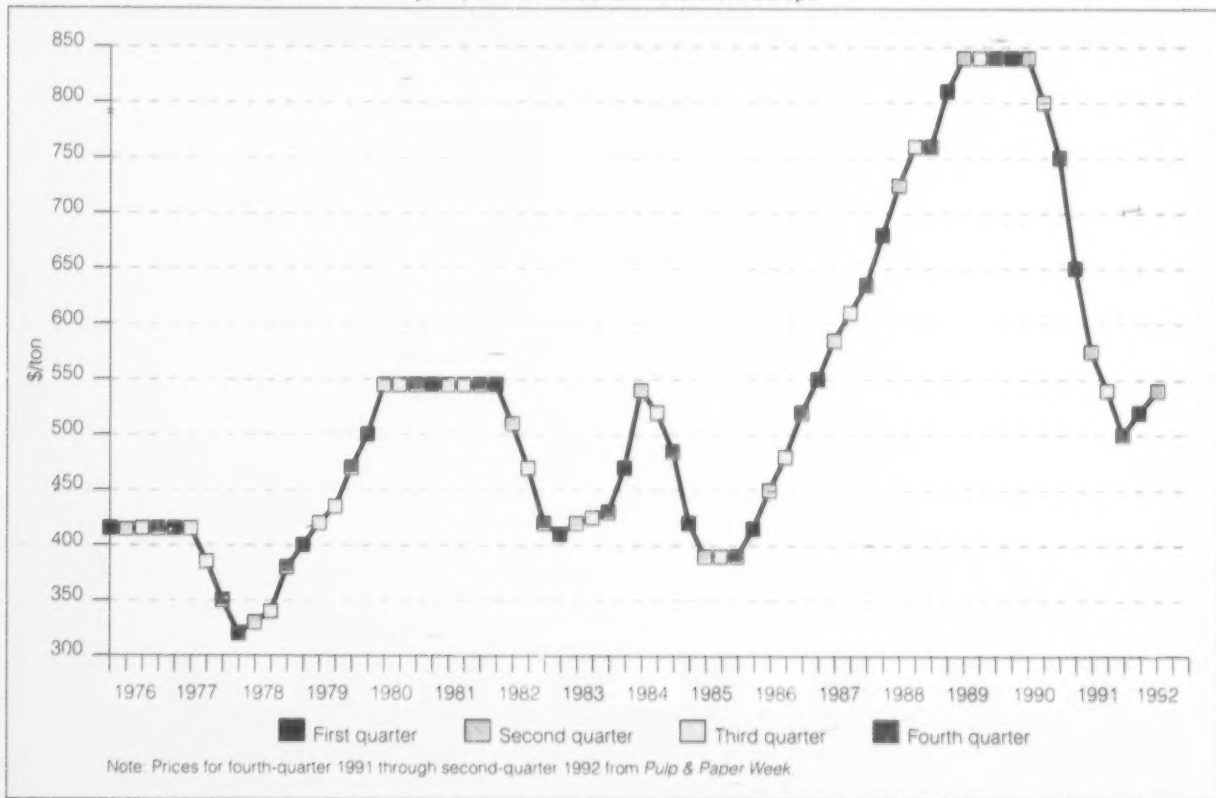


FIGURE 4: Northern bleached softwood kraft price, 1976 to 1992, \$/ton in Northern Europe.



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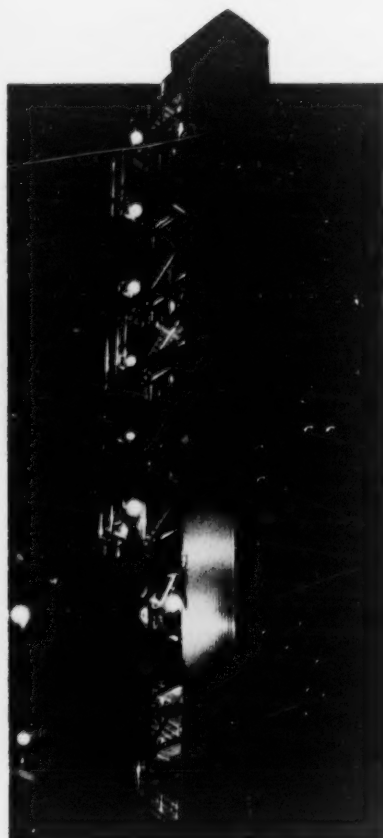
September 1992

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**14-article report on pulping, bleaching,
papermaking, and process control advances**

SEPTEMBER



THE COVER

The September issue is a special report on emerging engineering technologies—a comprehensive look at new pulping and papermaking processes that will shape the industry as it enters the twenty-first century. The report examines technologies currently in the pilot-plant stage or just being implemented (nonchlorine bleaching systems, artificial intelligence, biopulping/biobleaching), as well as developing technologies expected to become commonplace in the next several decades. A special thanks to Alabama River Pulp Co. for allowing P&P editors to photograph their mill in the dead of night. (Staff photo by Kelly H. Ferguson.)

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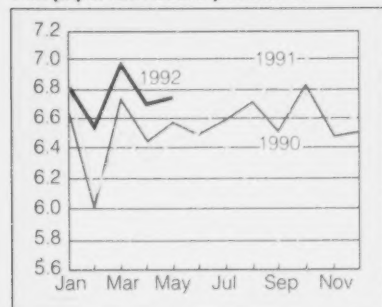
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- Stone forms Venezuela forest venture
- Jufo, Sanyo-Kokusaku plan merger

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.7 million tons in May, up 3.4% from the same month last year, according to the American Paper Institute. The seasonally adjusted production rate stood at 41.6 million tpy for paperboard, up 5.6% from a year earlier, and 39.3 million tpy for paper, up 2.3%. May production was down a seasonally adjusted 2.0% from the previous month, however, reflecting the slowdown in the general economy.

Among the major grades, printing and writing paper shipments were up 2.5% from year-earlier levels through the first five months, but the trend rate for May was off by 2.6% following a 1.9% decline in April. Newsprint production remained strong, posting a 4.0% increase over last year. Containerboard production for domestic use showed a 7.9% gain through May, but production for the export market was up just 1.1%. Market pulp shipments have risen sharply in 1992, up 12.3% through May compared with last year. Anticipation of the strike in British Columbia that began in mid-June contributed to the increase.

Canadian newsprint shipments totaled 815,000 metric tons in May, up 13.7% from a year earlier, according to the Canadian Pulp & Paper Assn. Operating rates rose to 96%. Woodpulp mills operated at 82%, and shipments rose 5.7% for the month to 737,000 tons.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	May	584	1.7	7,043	4.0
Uncoated groundwood (s)	May	127	-9.3	1,508	-12.4
Coated paper (s)	May	583	1.9	7,165	2.4
Uncoated free-sheet (s)	May	929	-2.9	11,684	5.3
Other printing/writing	May	121	-1.6	1,484	N/A
Total packaging and other paper (s)	May	378	3.0	4,697	2.0
Tissue	May	480	1.7	5,752	-0.1
Total paper	May	3,198	-0.2	39,332	2.3
Unbleached kraft paperboard	May	1,795	7.4	21,723	7.4
Semichemical medium	May	517	9.5	5,970	5.6
Bleached paperboard	May	381	-3.1	4,518	-1.8
Recycled paperboard	May	813	9.3	9,623	7.7
Total paperboard	May	3,506	6.9	41,834	6.1

Total U.S. paper and paperboard output	May	6,704	3.4	81,166	4.2
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	May	5,326	2.7	65,463	3.3
Market pulp production	May	805	13.4	10,012	11.3
Wastepaper consumption at paper/board mills	May	2,076	17.8	24,320	10.8
Pulpwood consumption (cords)	Apr.	8,411	1.7	99,414	-0.6

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	June	28.368	10.3	166,606 ⁶	6.3
Containerboard inventories at U.S. box plants and mills	May 31	2,960	14.7		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Apr.	987	-1.0	11,563	-6.0
Imports of Canadian newsprint	Apr.	576	-7.2	6,675 ⁶	-13.6
U.S. paper exports (including products)	Apr.	747	9.4	8,817	9.0
Exports of unbleached kraft linerboard	Apr.	275	16.5	3,153	3.3
Exports of woodpulp	May	646	12.2	7,556	18.1
Norscan pulp inventories ⁴	May 31	1,275	-19.5		
Norscan pulp operating rates ⁴	May	86%	92%	95%	93%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	May	815	13.7	3,612 ⁶	-1.7
Operating rates	May	96%	87%	87%	91%
Inventories held by U.S. consumers	May 31	N.A.			
Other paper/board shipments	May	625	-2.6	3,170	4.5
Woodpulp shipments (export only)	May	737	5.7	3,864	11.7
Operating rates	May	82%	87%	89%	90%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn. Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Uncoated groundwood: SC demand is bright spot in weak markets

Grade structure: Specialty newsprint grades (such as smooth or high-brightness news) are continuing to replace the low end of the uncoated groundwood grade scale (primarily rotogravure newsprint). At the same time, more and more mills move into machine-finished (MF), supercalendered (SC), and soft calendered grades at the higher end. There is a strong move toward converting older, less competitive newsprint machines to directory paper, a much higher-valued uncoated groundwood.

In general, uncoated groundwood papers have higher brightness levels and smoother surfaces than newsprint. Supercalendering and soft calendering add a glossy surface often competing with lightweight coated (LWC) groundwood papers. Brightness levels range from 64 to 74 Elrepho, compared to 56 to 62 for standard newsprint and 68 to 84 for LWC. Basis weights range from 20 to 45 lb/3,300 ft². Primary uses include preprinted newspaper inserts and direct mail flyers, catalogs, lower-cost business forms, Sunday newspaper magazines, and telephone directories.

Production/capacity: About 1.775 million tons of uncoated groundwood papers were shipped by U.S. mills in 1991, down 1.7% from 1990 because of the weak economy and cheaper prices for competing grades. Canadian mills shipped about 1.993 million short tons, a slight advance (2.0%) from 1990.

As the newsprint industry continues to suffer from overcapacity, inefficient equipment, and market factors, mills that have not shut down machines are planning to convert some to

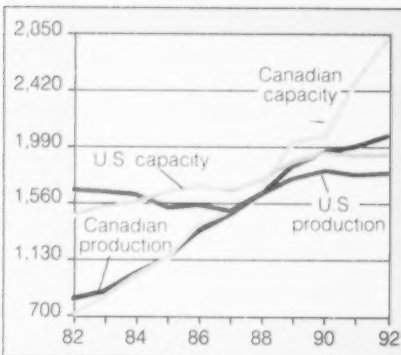
uncoated or coated groundwood. For example, Bowater Inc. plans to convert newsprint machines at the former Great Northern Nekoosa mills in Maine to higher-value groundwood or coated groundwood grades. In addition, both St. Marys Paper Inc. and Stone-Consolidated Inc. have built new SC machines at their mills in Sault Ste. Marie, Ont., and Grand-Mère, Que., respectively. However, Canadian Pacific Forest products shut down its Trois Rivières, Que., newsprint and groundwood papers mills in April 1992 because the inefficient mill could not make it in weak markets.

The closing of Trois Rivières is not taken into account in the following capacity figures: Canadian uncoated groundwood capacity is expected to increase 16.3% in the 1991-94 period, rising from 2.497 million short tons in 1991 to 2.905 million tpy. U.S. capacity is projected to increase only slightly, from 1.923 million tons in 1991 to 1.934 million tpy in 1994.

Outlook: Demand for uncoated groundwood papers is now estimated to rise 2.2% for 1992, with a strong 7.2% advance in 1993 and another healthy 4.8% in 1994. New capacity from European mills adds to the availability of SC papers and possibly keeps pricing at a level that makes the grade attractive to users of both lower-end grades and LWC papers.

Transaction prices (year-end, except 1992) for 34-lb premium supercalendered (\$/short ton) are: 1989, \$830; 1990, \$800; 1991, \$800; mid-year 1992, \$760. Prices for 35-lb offset, 65 brightness are: 1989, \$635; 1990, \$635; 1991, \$610; mid-year 1992, \$600. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1990r	1991r	1992e
Production	1,806	1,775	1,788
Capacity ¹	1,946	1,923	1,930
Utilization rate	92.8%	92.3%	92.6%
Imports	1,338	1,369	1,450
Exports	75	117	115
Apparent U.S. consumption	3,069	3,027	3,123
lb/capita	24.55	23.96	24.54
GDP ratio ¹	0.63	0.62	0.63
Canada²			
Production	1,954	1,993	2,076
Capacity	2,072	2,497	2,855
Exports	1,705	1,790	1,640
Utilization rate	94.3%	79.8%	72.7%

e = Pulp & Paper estimate r = Revised

1. American Paper Institute. 2. Canadian Pulp & Paper Assn. 3. 1,000 tons/\$ billion real GDP (1987).

TOP NORTH AMERICAN PRODUCERS

	Annual capacity (000 tons)	Market share (%)
1. Abitibi-Price Corp.	500	10.5
2. Stone-Consolidated Inc.	480	10.1
3. MacMillan Bloedel Inc. ¹	460	9.7
4. Bowater Inc.	320	6.7
5. Champion International	297	6.2
6. Boise Cascade Corp.	285	6.0
7. St. Marys Paper Inc.	270	5.7
8. Lake Superior Paper	240	5.0
9. Kruger Inc.	237	5.0
10. Madison Paper Industries ²	222	4.7

Market share of top five companies: **43.2%**

Market share of top ten companies: **64.9%**

North American capacity (1992): **4,757 million short tons**

U.S.: 1,930 Canada: 2,827

1. Units of Noranda Forest Inc. Total Noranda capacity is 744,000 tons. 2. Includes 20% capacity increase online June 1992.

SALES AND EARNINGS

Second period is first upturn in three years

A recent *Pulp & Paper Week* survey of 29 U.S. forest products companies showed second-quarter earnings of \$647 million, an increase of 5.2% compared with the same period in 1991 and the first year-to-year gain in profits in three years. Earnings advanced for the three months ending June 30, 1992 due to strength in wood products, improvement in the brown packaging grades, and reduced overhead costs as companies benefited from recent restructuring efforts. White paper grades and newsprint, however, continued to be very weak. Sales for the 29 companies surveyed were \$24.2 billion, up 5.0% relative to second-quarter 1991.

Though prices for certain lumber products fell from the highs reached in the first quarter of the year, earnings for the wood products sector continued to be very strong. Based on a sample of 10 companies that break out the performance of their wood products/building products segments, operating profits in the second quarter for this sector were up 40% year to year and 5% higher than in the first three months of 1992. Weyerhaeuser Co. and Georgia-Pacific Corp. were among the beneficiaries of strength in wood products. Weyco appears to also be reaping benefits from its recent restructuring efforts, most notably at its wood products manufacturing and distribution and containerboard packaging and pulp manufacturing segments, the company said. Louisiana-Pacific Corp., which generates about 90% of its revenues from building products, boasted one of the industry's strongest profit advances, attributing it to "strong markets for its construction panels and recovery of its Southern mills, where production had been sharply curtailed during the first quarter."

Among the larger, more diversified companies, International Paper Co. earned \$114 million, comparing favorably with adjusted earnings in both second-quarter 1991 (\$100 million) and first-quarter 1992 (\$104 million). The profit advance was driven by strong and/or improved performances at the company's timber and wood products, consumer packaging, and specialty businesses, as well as

cost controls, lower interest expense, and interest income from a tax settlement. IP did note, however, that the prices for uncoated printing and writing papers in the U.S. and European markets had weakened as the June quarter progressed.

Despite high marketing expenses, Kimberly-Clark Corp. reported that net income rose to \$138.2 million, up approximately 12% year to year. Major reasons for the improvement included higher sales volume, operating efficiencies at many of the company's U.S. manufacturing facilities, and lower raw material costs. In addition, K-C recovered an unspecified amount of legal fees related to the settlement of diaper litigation with Procter & Gamble Co.

Companies geared to printing and

writing papers and/or newsprint continued to flounder in second-quarter 1992. Boise Cascade Corp. posted a significant net loss, largely due to an operating deficit suffered at its paper and paper products operations and high interest expense. At Bowater Inc., the bottom line continued to slide to new lows as its pulp and paper segment reported an operating deficit equivalent to a \$33 loss for every ton of pulp and paper shipped. And it may be a while before results pick up meaningfully. At Champion International Corp., lower prices for newsprint and publication papers overshadowed a stellar performance by its wood products group as the company booked a \$9-million net loss, not including a roughly \$13-million gain related to the sale of timberland. ■

U.S. paper/products industry results.

Companies	Second-quarter 1992 (\$000)			
	Sales 1992	% change 1992/91	Earnings 1992	% change 1992/91
Boise Cascade Corp.	\$922,200	-0.1%	(\$44,970)	NM
Bowater Inc.	355,947	9.1	(24,416)	NM
Champion International Corp. ¹	1,229,570	4.3	(8,799)	NM
Chesapeake Corp.	229,294	4.8	4,293	76.6
Consolidated Papers Inc.	221,688	0.3	15,133	-38.4
Federal Paperboard Co. Inc.	345,300	-0.8	25,500	-5.3
Fort Howard Corp.	281,635	-3.9	(12,518)	NM
Georgia-Pacific Corp.	3,046,000	2.2	0	NM
P.H. Glatfelter Co.	138,913	2.8	15,447	-11.9
International Paper Co. ¹	3,386,00	8.7	114,000	14.0
James River Corp.	1,236,625	5.8	15,587	-31.2
Kimberly-Clark Corp.	1,748,600	3.6	138,100	12.1
Longview Fibre Co. (4/92)	172,868	9.3	9,679	195.2
Louisiana-Pacific Corp. ¹	539,100	11.2	48,100	64.7
Mead Corp. ¹	1,225,400	4.2	41,900	124.1
Mosinee Paper Corp.	57,551	23.9	877	NM
Pentair Inc.	296,735	4.5	8,180	-7.9
Pope & Talbot Inc.	129,764	-0.7	(2,623)	NM
Potlatch Corp.	328,399	3.7	20,034	70.2
Riverwood International Corp.	282,200	9.7	13,900	-0.7
Scott Paper Co. ¹	1,221,200	6.5	46,600	52.8
Sonoco Products Co.	461,573	9.3	29,578	32.1
Stone Container Corp.	1,371,100	3.3	(41,200)	NM
Temple Inland Inc.	523,500	7.8	47,700	17.5
Union Camp Corp.	778,790	6.6	22,729	-23.9
Wausau Paper Mills Co. (5/92)	94,957	7.6	10,667	29.3
Westvaco Corp. (4/92) ¹	593,422	6.4	36,414	19.3
Weyerhaeuser Co.	2,349,032	2.3	92,904	44.0
Willamette Industries Inc.	592,129	19.7	24,533	112.1
Totals	\$24,150,492	5.0%	\$647,329	5.2%

¹ Excludes major nonrecurring items.
() = losses. NM = not meaningful.

CAPITAL SPENDING

U.S. paper companies plan to trim capital spending by 2.8% in 1992

U.S. paper companies have been increasing their capital spending plans despite weak market conditions and depressed profits. According to a recent Commerce Dept. survey conducted in April and May, U.S. companies now plan to spend \$11.3 billion in 1992, down 2.8% from 1991 outlays of \$11.63 billion. However, this was up 5.0% from the previous Commerce Dept. survey conducted in the first quarter. A tabulation of capital spending plans for 11 major U.S. pulp and paper companies culled from recent annual reports and company statements also shows spending will be relatively flat in 1992.

Spending by Canadian paper companies shows a similar mixed pattern, with environmental projects related to dioxin reduction and deinking installations helping keep outlays up despite recent substantial financial losses. ■

North American paper company capital spending plans (\$ millions).

	1990	1991	1992e	% change 1992/91
U.S.				
Bowater Inc.	\$214	\$160	\$135	-15.6%
Champion International Corp.	926	575	625	8.7
Georgia-Pacific Corp.	866	528	500	-5.3
International Paper Co.	1,267	1,197	1,200	0.3
James River Corp.	457	467	467 ¹	0.0
Mead Corp.	490	274	300	9.5
Potlatch Corp.	318	267	223	-16.5
Scott Paper Co.	815	315	450 ¹	42.9
Union Camp Corp.	934	483	250	-48.2
Westvaco Corp.	487	303	360	18.8
Weyerhaeuser Co.	928	663	750	13.1
Canada				
Abitibi-Price Inc.	C\$106	C\$39	C\$50	28.2
CP Forest Products Ltd.	426	350	300	-16.7
MacMillan Bloedel Ltd.	367	241	300	24.5
Fletcher Challenge Ltd.	248	176	70	-60.2

e=estimate. Source: Company annual reports, releases.

1. Estimate based on company statement.

RECYCLED NEWSPRINT

Federal recycling law defies opposition

The House Energy and Commerce Committee defied opposition from an unlikely coalition of environmentalists and the Bush Administration in approving a solid-waste disposal bill July 3, sending the measure to the floor of the House of Representatives for a vote.

The bill is seeking to make packaging producers reduce the amount of virgin material they use and also will require newspapers above 200,000 circulation to meet annual recycled-fiber-content standards of 35% by 1995 and 50% by 2002, far higher than the 16% aggregate average recycled content of most newspapers today. This area of the legislation is stirring opposition by both newspaper and newsprint industry forces, who are joining the government and environmental forces already opposing the bill but with contradictory motivations. The Bush Administration opposes the bill because it is too costly and environmentalists because it is too weak.

Newspaper sources said the legislation will push up newsprint prices and tie up recycled-content newsprint supplies for large customers,

making it harder for smaller newspapers to acquire recycled in order to comply with existing state laws. Violators of the law will be fined \$25 for each ton that does not meet the new standards and be required to display a statement on mastheads stating they do not meet recycled requirements. Advertising competitors such as catalogs and Yellow Pages will not be forced to give up lower-cost virgin paper, newspaper industry representatives argue.

Federal mandates will add costs to newspapers and newsprint producers alike, observers said, harming Canadian mills that are distant from sources of old newspaper (ONP) as well as interfering with the development of new uses for ONP, such as in the areas of insulation and animal bedding.

Both of the bill's sponsors, committee chairman Representative John Dingell (D-Mich.) and Representative Norman Lent (R-N.Y.), shored up support for the solid waste bill by agreeing that neither would support new amendments proposed for debate unless they were supported by the other. Dingell authored the newsprint

area of the legislation, reacting to a glut of ONP that is not being consumed and which has kept waste-paper prices low.

"This establishes the principle that the polluter pays," said an Energy and Commerce Committee spokesman, adding that, despite a decline in recent years, ONP remains the single largest contributor to the solid waste stream. Dingell said that only six daily newspapers would currently meet the proposed standards, but paper industry sources countered that four of them enjoyed equity in recycled newsprint mills, which enhanced their ability to achieve high recycled-content levels.

"Unfortunately, there was no recognition that the newspapers of this country, in a very short time, have written a recycling record we can all view with pride," stated Newspaper Assn. of America (NAA) president Cathleen Black. "This amendment is a flat reversal of the carrot and stick approach. Unfortunately, it sends a clear message to other industries that voluntary recycling efforts not only will go unrecognized, they will actually be penalized." ■

U.S. Nonwood Fiber Potential Rises as Wood Costs Escalate

Modern technologies in harvesting, handling, and pulping nonwood fibers could restore former papermaking importance

By JOSEPH E. ATCHISON

When considering a greater use of nonwood plant fibers in the U.S., it should be remembered that straw and cotton rags were used here as papermaking raw materials before wood was used. Furthermore, at one time practically all corrugating medium was produced from straw, and the quality was excellent.

However, because the economics of pulp production have favored wood in the U.S., production and use of nonwood plant fiber pulps declined over the past 30 years; therefore, during 1991, total production of nonwood plant fiber pulp in the U.S. amounted to about 240,000 metric tons out of a worldwide total pulp production in excess of 57 million metric tons. This tonnage consisted mainly of pulp for specialty papers, including cotton fiber for currency and other specialty papers, cotton linters and flax straw for cigarette paper, bagasse for insulating board, and abaca (manila hemp) and other specialty fiber pulps for tea bags, filter papers, sausage casings, etc.—all of which sell at a very high price.

In contrast to the decrease of these straws as raw materials in the U.S., the worldwide increase in production capacity of nonwood plant fiber pulps has increased dramatically in the past 15 years, going from 6.9% of total world papermaking pulp capacity in 1975 to 8.5% in 1990. It is projected that this percentage will increase to as much as 10% by 1995. The average annual increase in nonwood plant fibers pulping capacity has been appreciably higher than the average annual increase in wood pulping capacity, and it is projected to be two to three times the average increase in wood pulp capacity during the 1990-95 period.

For quality reasons, straw, bagasse, and bamboo are the leading fibers being used, but many other nonwood plant fibers are being used for specialty pulps. In many countries, pulp production is based entirely on nonwood fibers, and 21 countries—led by China and India—depend on nonwood plant fibers for more than 50% of pulp

production.

A proper blend of nonwood plant fibers can produce most grades of paper and paperboard. However, the logical development in the U.S. would appear to be merely adding a nonwood fiber line to a pulp and paper mill with an existing chemical recovery system.

Surprisingly, modern technology for production of pulp from nonwood plant fibers was developed primarily in the U.S. It was based on extensive research and development programs on bagasse pulping, which started in the 1950s and continue in both the U.S. and other major sugarcane-producing countries today. Although used only to a limited extent in the U.S., this technology has spread worldwide and has laid the foundation for the modern bagasse pulping industry.

Fortunately, the technology that was developed for bagasse can be applied to other nonwood fibers as well and is being applied to straw, bamboo, reeds, grasses, cotton linters, and other raw materials worldwide. Although the economics of U.S. pulp production in the recent past have favored wood, it is thought that as pulpwood costs continue to rise, the time is approaching—at least in some areas of the U.S.—when some of these alternative fibers will again become economical and will be used to a greater extent.

What then are the alternative raw materials that hold the best promise in the U.S.? For the medium to long term, it is believed that the most promising nonwood plant fibers for use on a reasonably large scale are as follows:

- Sugarcane bagasse
- Cereal straws including wheat, rye, barley, oats, and rice
- Seed-grass straw
- Grain sorghum stalks
- Kenaf and crotalaria.

Table 1 shows the potential availability of nonwood plant fibers as raw materials in the U.S. Some brief comments on each of these alternative fibers follow.

BAGASSE. When considering the use of bagasse, an important factor is the cost of replacement fossil fuel to generate the necessary steam and power for the sugar

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Table 1: Estimated availability of specific nonwood plant fibrous raw materials in the U.S.

Raw materials	Potential availability in the U.S. (b.d. metric tons)
Sugarcane bagasse	4,680,000
Wheat straw	72,000,000
Barley straw	6,000,000
Oat straw	10,000,000
Rye straw	800,000
Rice straw	2,500,000
Seed flax straw	500,000
Seed grass straw	1,000,000
Subtotal straw	92,800,000
Total cotton staple fiber	3,100,000
Total first- and second-cut linters	460,000
Cotton stalks	4,600,000
Corn stalks	129,000,000
Sorghum stalks	28,000,000
Kenaf and crotalaria bast fibers	N.A. ¹
Total	262,640,000

1. Unlimited quantities can be grown.

mill operation. Therefore, the equivalent heating value in replacement fuel must be furnished for whatever bagasse is taken away.

Normally, however, the moist depithing of the bagasse—at 50% moisture content—is carried out at the sugar mill and the pith returned to the sugar mill boiler. Thus, the pulp mill furnishes replacement fuel for only the moist depithed bagasse, plus the cost of moist depithing and a small premium payment above the actual cost of fuel.

The amount of bagasse available in the various cane sugar-producing areas and the moist depithed bagasse that might be obtained from the sugar mills, plus the potential bleached pulp and/or the potential semiedium, are shown in Table 2.

Bagasse could come into play as a supplementary pulp, especially in pulp and paper mills located in Louisiana and Texas, by merely adding a bagasse pulping line to an existing pulp mill, or to an existing particleboard or medium-density fiberboard (MDF) plant. The bleached pulp could supplement bleached hardwood

pulp, the semichemical pulp could supplement hardwood semichemical pulp, and chemimechanical bagasse pulp could supplement mechanical woodpulp for newsprint. Well-prepared bagasse is also excellent for particleboard or MDF. Greenfield bagasse-based mills might also be considered for corrugating medium or MDF in any of the cane sugar-producing states, including Louisiana, Florida, Texas, and Hawaii.

CEREAL STRAWS. As shown in Table 1, total cereal straw in the U.S., including straw from wheat, rice, rye, oats, and barley, amounts to more than 90 million metric tons, or more than 100 million short tons. Fairly substantial amounts of some types of cereal straw are available in almost all of the lower 48 states, with large quantities available in many of the major pulp- and paper-producing states. Wheat straw is the most commonly used cereal straw for manufacture of pulp, and more than 80 million tons are available in the U.S. However, straw from rye, barley, oats, and rice is also being used to a limited extent in other countries.

All corrugating medium in the U.S. was once produced from straw in the Midwest, and at one time both Mead Corp. and Alton Boxboard had small bleached straw pulp mills as well. In fact, as many as 25 Midwestern mills produced high-quality straw corrugating medium as recently as World War II. These mills were using inefficient methods of collection, baling, and storage, and the old rotary batch globe digester had four-hour cooking cycles; therefore, as labor costs escalated, these mills either modernized and switched to hardwoods or went out of business.

However, the adoption of modern technology for collection, baling, and handling straw, combined with the high-yield horizontal continuous digester (using a screw feeder for a quick cook of 10 to 12 minutes), would drastically change the entire economics of straw utilization in the U.S. It is foreseen that straw use will make a comeback, especially for such grades as corrugating medium.

SEED-GRASS STRAW. The straw residue from growing grass for seed is also a potentially attractive supplementary raw material. In the Willamette Valley of Oregon alone, more than one million tons of straw residues from seed-grass production are burned annually.

Table 2: Total U.S. annual bagasse production and potential yields of bleached pulp and high-yield pulp by state.

State	Total whole bagasse produced (b.d. short tons)	Potential moist depithed bagasse	Potential bleached pulp	Potential high-yield pulp
Florida	1,800,000	1,080,000	432,000	648,000
Louisiana	1,200,000	720,000	288,000	432,000
Hawaii	1,300,000	780,000	312,000	468,000
Puerto Rico	200,000	120,000	48,000	72,000
Texas	180,000	108,000	43,000	65,000
Total	4,680,000	2,808,000	1,123,000	1,685,000

The straw from annual rye-grass, which represents the largest single seed-grass crop, has been thoroughly investigated by Oregon State Univ., and results indicate that pulp produced from this straw is equally as good as pulp from wheat straw. Therefore, this raw material could serve as a supplementary raw material for hardwood pulps in that general area, either for bleached grades or for corrugating medium, or even for linerboard in percentages up to 25%.

The large seed-grass growers already have storage sheds in which the straw could be stored and brought into the mill as required, so the pulp mills would not have to store large quantities of the straw. Thus this raw material appears to be particularly attractive for consideration by mills in the area of the Willamette Valley.

GRAIN HARVEST STALKS. It is estimated that as much as 28 million tons of grain sorghum stalks are available annually in the U.S. in some 20 states, with the largest concentration in Kansas and Texas. All the technology developed for bagasse and straw can likewise be used for collection, preparation, handling, storage, and pulping sorghum stalks, especially for use in the production of corrugating medium. The large quantities of these stalks in concentrated areas make the use of this raw material particularly attractive.

THE SPECIAL CASE OF KENAF AND CROTALARIA. For the past 25 years, the USDA has been making concentrated efforts to develop the use of kenaf. Studies have involved both growing and pulping this raw material. Kenaf was selected from more than a thousand possible crops as having the greatest potential as a new fiber crop that would not compete with agricultural crops now in surplus supply. The USDA also investigated crotalaria, or sunn hemp, which likewise has good potential.

In addition to the work in the U.S., where a number of private companies have been making concentrated efforts to commercialize the use of kenaf in recent years, extensive work on the use of kenaf has been carried out in Australia, China, India, Thailand, and many other countries. Therefore, kenaf and crotalaria appear to hold considerable promise as papermaking raw materials.

Both kenaf and crotalaria consist of two distinctive components which differ both physically and chemically. The bark, or outside of the stem, contains the bast fibers that have a relatively long length. This material makes excellent long-fiber pulp, superior to most softwood pulps. It can also be used as a component of specialty pulps such as for cigarette paper. The bark represents 30% to 35% of the dry weight of the kenaf stalk.

The inside of the stalk, or core, represents 65% to 70% of the dry weight but has an extremely short fiber length of about 0.6 mm. Therefore, it is not suitable for chemical pulp but can be used for production of mechanical pulp and for many other purposes.

Extensive work on the use of whole-stalk kenaf for newsprint has been carried out in the U.S. over the past

10 years, financed heavily by the USDA and fully supported by The American Newspaper Publishers Assn. and several individual publishers. Several full-scale test runs have been carried out on commercial newsprint machines in which varying percentages of whole-stalk kenaf chemi-thermomechanical pulp have been blended into the newsprint furnish, with up to 90% of this pulp being used successfully.

The resulting newsprint has been printed by various publishers and has been found to fully meet North American standards for newsprint. Unfortunately, in spite of well-financed promotion, these efforts with whole-stalk kenaf have not been successful in developing a full-scale kenaf newsprint mill in Texas.

Conversely, intensive work has been carried out on developing efficient techniques to separate the bark (containing the bast fiber) and the short-fibered core material. By separating these two components of kenaf or crotalaria, pulping the bark, and using the core material for purposes to which it is more suited, a number of interesting possibilities are presented. The bark fiber results in an extremely high-quality pulp that can be used in some high-priced specialty papers, whereas the core material has possibilities for mechanical pulp, as fuel, or for a number of other uses based on its absorbency and biodegradability.

Already, there are at least three small commercial separation plants in operation that are capable of handling either kenaf or crotalaria: Mississippi Delta Fiber Cooperative in Charleston, Miss., (*P&P*, July 1992, p. 57); Agro-Fibers Inc. in Corcoran, Calif., a subsidiary of the McCarthy Farms Organization; and Natural Fibers of Louisiana, operated by H. Willett & Associates in Jeanerette, La. All of these organizations have found valuable uses for the core material. Therefore, the bark fiber can be made available as a supplementary raw material for pulp and paper mills at a reasonable price.

CONCLUSIONS. On a worldwide basis, the future use of nonwood plant fibers on a large scale is indeed a reality. For the medium- and long-term future, greater use of these raw materials in the U.S. will become a reality as well. With an annual availability of more than 100 million tons of cereal straw, 2.8 million tons of moist depithed bagasse, one million tons of seed-grass straw, and as much as 28 million tons of sorghum stalks, plus the exciting potential for kenaf and crotalaria, papermakers should certainly consider these alternatives at least as supplementary raw materials to woodpulp.

The advanced technology originally developed for bagasse is now being used in many countries for straw and other nonwood plant fibers, because the economics of using these raw materials has changed greatly since their use had to be abandoned years ago in the Midwest. There is no doubt that the economics of using these raw materials are already favorable in the U.S., especially in areas where pulpwood costs have escalated in recent years. ■

NOTE

ONLY THE FOLLOWING PAGES OF THIS

PUBLICATION HAVE BEEN FILMED

Cov. 1, Pgs: 3, 5, 7, 9,

15, 17, 61-63, 69-71, 74-

76

PULP & PAPER



October 1992

C 3975-2

*****ALL FOR SDC
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SERVICE INC./SRI
CONGRESSIONAL INFORMATION
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BETHESDA MD 20814

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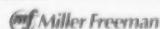
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PULP & PAPER (ISSN 0033-4081) (Canadian GST permit number 124513185), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN INC., 600 Harrison St., San Francisco, Calif. 94107. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send address changes to PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107. © Copyright 1992 by Miller Freeman Inc. All rights reserved. **Subscriptions & Address Change:** Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$90.00 a year in the U.S. All subscriptions to other countries: US\$110.00 a year, except Europe and Mediterranean. US\$125.00 (air service included). Single copy, US\$9.00, except Buyers Guide, US\$50.00. 16mm microfilm, 35mm microfilm, 105mm microfiche, and article and issue photocopies are available from University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106; (313) 761-4700. Requests, subscription orders, and address changes must show name and position or job of individual, the name and location of mill, plant or office where employed, and the exact business or product produced at this location. **Send subscription correspondence to:** Circulation Department, PULP & PAPER, 600 Harrison St., San Francisco, Calif. 94107, or call Subscriber Service at 415-905-2150. For address change, include label from recent issue.

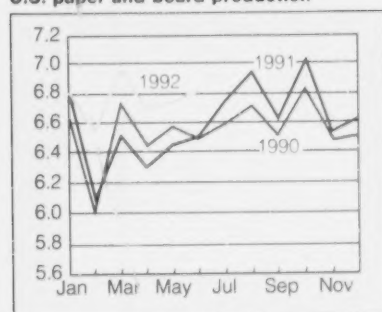


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MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.8 million tons in May, up 5.6% from the same month last year, according to the American Paper Institute. Production rebounded from a drop-off in May despite continued weakness in the economy. The seasonally adjusted production rate stood at 41.8 million tpy for paperboard, up 5.7% from a year earlier, and 39.4 million tpy for paper, up 1.5%. Most of the improvement was in the paper grades, which suffered a weak first quarter.

Among major grades, printing and writing paper shipments were up 2.0% from year-earlier levels through the first half, led by a gain of 8.5% for coated free-sheet and 3.5% for uncoated free-sheet. Newsprint production remained strong, posting a 3.7% increase over last year. Containerboard production for domestic use was up 8.6% through the first half, but production for the export market registered a gain of just 0.4%.

Canadian newsprint shipments totaled 766,000 metric tons in June, up 4.8% from a year earlier, according to the Canadian Pulp & Paper Assn. Operating rates fell to 84%. Woodpulp mills operated at just 71% due to the month-long strike in British Columbia, while shipments dropped 4.3% to 688,000 tons.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION ¹

Newsprint	June	572	2.3	7,014	3.7
Uncoated groundwood (s)	June	123	-15.2	1,504	-9.5
Coated paper (s)	June	655	9.9	7,306	2.6
Uncoated free-sheet (s)	June	957	3.8	11,442	3.5
Other printing/writing	June	128	11.3	1,491	-1.3
Total packaging and other paper (s)	June	385	5.2	4,580	2.4
Tissue	June	470	-0.8	5,732	-0.2
Total paper	June	3,291	3.6	39,169	2.0
Unbleached kraft paperboard	June	1,845	10.1	21,792	7.8
Semichemical medium	June	507	8.6	5,990	6.2
Bleached paperboard	June	376	-1.1	4,518	-1.8
Recycled paperboard	June	803	5.2	9,624	7.2
Total paperboard	June	3,531	7.5	41,923	6.3

Total U.S. paper and paperboard output	June	6,822	5.6	81,093	4.2
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PULP, WASTEPAPER & FIBER ²

Total U.S. woodpulp production	June	5,420	4.3	65,380	3.5
Market pulp production	June	846	13.6	10,035	11.6
Wastepaper consumption at paper/board mills	June	2,095	16.4	24,457	10.9
Pulpwood consumption (cords)	May	8,693	7.2	100,394	0.9

CONVERTED PRODUCTS STATISTICS ³

Corrugated box shipments (billion ft ²)	June	28,368	10.3	166,606*	6.3
Containerboard inventories at U.S. box plants and mills	June 30	2,607	-0.4		

INTERNATIONAL TRADE ²

U.S. paper imports (including products)	May	1,060	5.2	11,794	-3.8
Imports of Canadian newsprint	May	642	-0.9	6,881*	-11.1
U.S. paper exports (including products)	May	767	9.9	8,895	9.2
Exports of unbleached kraft linerboard	May	274	5.4	3,180	3.8
Exports of woodpulp	June	630	9.9	7,344	13.4
Norscan pulp inventories*	June 30	1,110	-31.7		
Norscan pulp operating rates*	June	82%	86%	92%	90%

CANADIAN STATISTICS ⁵ (reported in metric tons)

Total newsprint shipments	June	766	4.8	4,378*	-0.6
Operating rates	June	84%	87%	86%	90%
Inventories held by U.S. consumers	June 30	N.A.			
Other paper/board shipments	June	633	3.4	3,800	4.2
Woodpulp shipments (export only)	June	688	-4.3	4,552	9.0
Operating rates	June	71%	90%	86%	90%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Corrugating medium: Production to push capacity limits with any sustained pickup in demand

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. Semichemical medium may not contain less than 75% virgin woodpulp (mainly semichemical). The share of total medium capacity held by semichemical has declined to about 73% in 1992 from 79% in 1980, while recycled has grown to 27%. Basis weights for corrugating medium are 22, 26, 33, 36, and 40 lb/1,000 ft². Standard sheet weight is 26 lb, which accounts for about 77% of production, although heavier weights have been growing in popularity.

Production/capacity: The corrugating medium market has been tightening, with stronger demand and almost no growth in new capacity. The result is that operating rates for corrugating medium should be among the highest for any grade of paper and paperboard. U.S. corrugated box shipments this year are forecast to increase about 2.9% following only 0.6% growth in 1991. Corrugating medium production (semichemical and recycled) was up about 6.6% through the first half from a year earlier, according to the American Paper Institute. Production was helped by about a 170,000-ton rise in medium inventories at box plants and mills (through July) from below normal levels at the end of 1991.

Medium production for the remainder of the year is expected to be relatively flat due to inventory reduction and more difficult year-ago comparisons with a stronger second half of 1991. For all of 1992, production is expected to increase about 3.8% from a year ago to a new record of 7.94 million tons. Operating rates for semichemical medium are expected to average almost 98%, while rates for recycled medium mills improve to 91% in 1992.

Outlook: With further gradual strengthening in the economy, U.S. corrugated box shipments are ex-

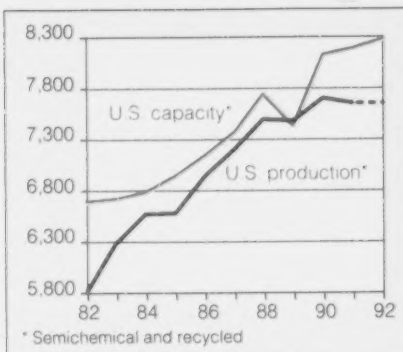
pected to show about 3.3% growth in 1993. Corrugating medium production is expected to rise 3.0% to 8.18 million tons, reflecting some further inventory reduction. However, capacity for corrugating medium is expected to rise only about 0.4% in 1993, with most of the growth in recycled board. As a result, operating rates for semichemical medium are expected to be around 99%, while rates for recycled medium reach 95%.

The only new semichemical medium capacity is from machine rebuilds that have recently been completed at Menasha Corp., Willamette Industries Inc., and Weston Paper & Manufacturing Co. Recycled medium will show somewhat stronger growth with additional capacity from Temple-Inland Inc.'s new containerboard mill at Maysville, Ky., scheduled to start up this fall, and Interstate Resources Inc.'s new 170-tpd mini-machine at Reading, Pa., scheduled to come online in late 1993. The supply squeeze may be eased by recycled machines swinging production from other grades and reactivation of idle machines.

Prices: Producers have begun to raise prices on corrugating medium and narrow an unusually large gap that developed with linerboard prices. After reaching a peak of close to \$400/ton in the second quarter of 1988, prices for semichemical medium began to erode and bottomed around \$280-290 by mid-1991. Producers pushed through a \$30/ton price increase in the fall of 1991 but have announced a \$40-50/ton price increase for the fall of 1992 after an unsuccessful attempt to raise prices last spring.

Year-end transaction prices for semichemical medium in the eastern U.S. are as follows: 1988, \$380-390; 1990, \$300-320; 1991, \$310-320. (See P&P Factbook for complete price histories.) Prices are higher on the West Coast where supply has been the tightest.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1991	1992e	1993e
Production			
Semichemical	5,711	5,890	6,030
Recycled	1,938	2,050	2,150
Total	7,649	7,940	8,180
Capacity ¹			
Semichemical	5,957	6,025	6,069
Recycled	2,227	2,251	2,263
Total	8,184	8,276	8,332
Utilization rate			
Semichemical	95.9	97.8	99.4
Recycled	87.0	91.1	95.0
Imports	100	135	140
Exports	170	180	180
Apparent U.S. consumption	7,579	7,895	8,140
lb/capita	55.7	56.9	58.9
GNP ratio ²	1.59	1.60	1.62

1. American Paper Institute capacity survey (1991)

2. 1,000 tons/\$ billion real GNP e = Pulp & Paper estimate

TOP U.S. PRODUCERS (000 tpy)

	Semichemical	Recycled medium	Total	Market share (%)
1. Stone Container Corp.	695	235	930	1.2
2. Georgia-Pacific Corp.	845	—	845	10.2
3. Packaging Corp. of America	750	70	820	9.9
4. Weyerhaeuser Paper Corp.	730	—	730	8.8
5. Inland Container Corp.	245	430	675	8.2
6. Jefferson Smurfit Corp.	115	390	505	6.1
7. Mead Corp.	385	—	385	4.7
8. International Paper Co.	360	—	360	4.3
9. Willamette Industries Inc.	185	175	360	4.3
10. Virginia Fibre Corp.	285	—	285	3.4

Market share of top five companies:

48.3%

Market share of top ten companies:

71.2%

U.S. medium capacity (1992):

8,276 million short tons

(semichemical and recycled)

1. Includes G-P's 50% interest in a 170,000-tpy machine at Sonoco Products Co.'s Hartsville, S.C., mill.

MARKET PULP

Weyco to buy two P&G pulp mills

In a move that would clearly make it the world's largest market pulp producer, Weyerhaeuser Co. signed an agreement in mid-August to buy two market pulp mills, three sawmills, and about 175,000 acres of timberland from Procter & Gamble Co. The \$600-million deal includes a fluff pulp mill in Oglethorpe, Ga., a softwood kraft pulp mill in Grande Prairie, Alta., sawmills in both Grande Prairie and Grande Cache, Alta., and Barnesville, Ga., and forestland in Georgia. These were among the pulp-related assets P&G put up for sale last March (P&P, May 1992, p. 25).

The sale is contingent upon the transfer of a forest management license for 2.8 million acres of Alberta timberland, among other "standard conditions," and is expected to close by the end of the year. About 1,500 P&G employees will be affected, but they will all be offered continued employment. Weyco reportedly will finance the acquisition with internal funds and the issuance of commercial paper.

Jack Creighton, Weyco president and CEO, said, "This is the first major strategic opportunity since our refocusing effort and one of the largest in our history... It is a significant step toward improving our ability to be the best forest products company in the world." He said that the purchase would "provide immediate earnings and cash flow and long-term benefits to Weyerhaeuser."

Analysts estimate Weyco's earnings will rise nearly 10% in 1993 as a result of the transfer, though P&G reportedly indicated its own earnings would not be materially affected.

The acquisition will make Weyerhaeuser the world's largest market pulp producer, especially in fluff pulp, with an estimated market pulp capacity of 1.5 million metric tpy. (Georgia-Pacific Corp. has been neck and neck with Weyco in market pulp capacity since its purchase of Brunswick Pulp & Paper Co. in 1988.) A Weyco spokesman said production at Oglethorpe (also known as Flint River) was around 300,000 tpy in 1991, and Grande Prairie was approximately 280,000 tpy. Adding these facilities will raise Weyco's market pulp capac-

ity to about 2.1 million tpy. A second spokesman said another benefit of the transaction is that the firm "gets top-performing facilities without increasing world capacity." He added that Oglethorpe went online in 1981 and Grande Prairie in 1973.

Weyco said that P&G will "remain a customer" for the Oglethorpe and Grande Prairie mills. P&G will buy all

of Oglethorpe's pulp at market price and half of the Grande Prairie mill's output. Oglethorpe's fluff pulp is used to make diapers, and Grande Prairie's kraft pulp goes into tissue, towel, and paper products. The former head of P&G's pulp division was leading a leveraged buy-out attempt for P&G's two remaining pulp mills and related timberland. ■

Temple-Inland sets \$500-million project

The board of directors of Temple-Inland Inc. has approved a \$500-million expansion and modernization project at the company's bleached pulp and paperboard mill in Evadale, Texas. The series of capital projects includes the addition of a fifth paper machine, the construction of a new softwood pulp line, and the upgrade of the mill's three existing fourdrinier paper machines. The mill's one cylinder-board machine was modified several years ago to produce specialty products and is not scheduled for any major upgrade.

The proposed capital program will increase the mill's total market pulp and board capacity by 40%, or 240,000 tpy, to 812,000 tpy. Construction could start in early 1993 and be completed by the third quarter of 1996.

assuming all environmental permits required for the expansion are granted. The company said it plans to issue \$250 million in new long-term debt to finance the upgrade, with the balance of the money coming from internal cash flow. Capital spending for Temple-Inland reached \$378 million in 1991. Most of the recent capital spending has been directed toward the company's Inland Container Corp. unit, which is completing construction of a new recycled linerboard mill in Kentucky.

The Evadale mill produces about 475,000 tpy of bleached board and 100,000 tpy of market pulp. Approximately 250,000 tons of the bleached board output goes into food service end uses, and the major product lines are paper cups and plates. ■

SALES AND EARNINGS

Canadian industry shows signs of life

After more than three years of steady deterioration, profitability in the Canadian forest products industry showed signs of changing course in second-quarter 1992, thanks to strength in the wood products sector, a weakening in the Canadian dollar, low interest rates, benefits from cost reduction efforts, and an upward trend in market pulp prices. Even so, the industry continued to lose money as pricing for paper grades, particularly newsprint, remained depressed. In addition, West Coast producers were hurt (although most only modestly) by an industry-wide labor strike in British Columbia that was subsequently settled in mid-July.

For the three months ending June 30, 1992, a *Pulp & Paper Week* survey of 17 companies showed a net loss of C\$206 million, excluding net nonrecurring charges of C\$19 million. In comparison, the same 17 companies lost C\$218 million in the year-ago period and C\$277 million in the first three months of 1992. The modest narrowing of the deficit, relative to the second quarter of 1991, marks the first year-to-year improvement in profits since as far back as the fourth quarter of 1988. Sales, meanwhile, rose to \$4.6 billion for the three months ending June 30, 1992, up 1.5% year to year and 7.8% higher than in first-quarter 1992.

Neither of the British Columbia giants, Fletcher Challenge Canada Ltd. or MacMillan Bloedel Ltd., was able to stem the flow of red ink. Both companies reported that the British Columbia industry-wide strike, which curtailed operations in the second half of June, had no significant impact on financial results. Fletcher Challenge added that increased customer orders in preparation for the strike caused operating rates and sales volume to improve.

Thanks to their orientation to wood products, Weldwood of Canada Ltd., West Fraser Timber Co. Ltd., and Slocan Forest Products Ltd. were among the handful of Canadian forest products companies that managed to post profits in second-quarter 1992. Yet, despite signs that cost-cutting efforts are helping to moderate losses, depressed paper prices, especially for newsprint, continued to undermine profitability of the eastern Canadian producers.

Abitibi-Price Inc. reported a loss of C\$41.3-million as "pricing for newsprint, uncoated groundwood, and coated papers continued to reflect excess industry capacity in North America." Abitibi's bottom line is expected to remain under considerable pressure for at least the next few months given that the 5% reduction in newsprint discounts, proposed for Aug. 1, is now expected to have relatively little impact on realizations during the third quarter.

Canadian Pacific Forest Products Ltd. reported a C\$59.5-million net loss, modestly worse than in the year-ago period, as the company continued to suffer from low pricing in its major product lines—newsprint, market pulp, and white papers. On the plus side, the company cited lower production costs and benefits from a weaker Canadian dollar, which averaged about US3¢ lower compared with last year, and noted its bottom line had significantly improved relative to the C\$71.1-million deficit posted in first-quarter 1992.

Although still posting sizable net deficits, Domtar Inc. reported that quarterly operating profits, excluding nonrecurring items, improved by C\$16 million year to year as higher shipments (primarily out of the Windsor mill) reduced overhead costs, and an estimated C\$15-million favorable impact from the weaker Canadian dollar was partially offset by lower prices for its main products.

Canadian paper industry results.

Companies	Second-quarter 1992 (C\$000)			
	Sales 1992	% change 1992/91	Earnings 1992	Earnings 1991
Abitibi-Price Inc.	\$691,900	-5.2%	(\$41,300)	(\$5,700)
CP Forest Products Ltd. ¹	462,200	-8.0	(59,500)	(57,500)
Canfor Corp.	272,900	27.5	(9,100)	(15,700)
Cascades Inc. ¹	212,356	4.1	6,920	6,687
Crestbrook Forest Industries Ltd.	38,197	-9.5	(3,288)	(3,351)
Doman Inc.	136,830	-3.9	(3,323)	(10,379)
Domtar Inc. ¹	484,000	3.4	(27,000)	(37,000)
Fletcher Challenge Canada Ltd.	225,900	-16.2	(20,100)	(16,500)
MacMillan Bloedel Ltd.	775,500	6.5	(7,100)	(11,300)
Noranda Forest Inc. ¹	1,148,000	5.8	(14,000)	(42,000)
Perkins Papers Ltd.	19,928	9.3	(2,032)	443
Repap Enterprises Corp.	288,200	1.5	(35,800)	(34,600)
Scott Paper Ltd.	97,941	-6.8	274	3,213
Slocan Forest Products Ltd.	61,300	9.5	2,359	(133)
Tembec Inc. ¹	99,913	53.2	(4,304)	139
Weldwood of Canada Ltd.	180,300	-6.9	4,500	100
West Fraser Timber Co. Ltd.	179,900	18.8	2,900	(34)
Totals²	\$4,599,665	1.5%	(\$206,344)	(\$217,965)

1. Exclude some major gains or losses.
2. Noranda Forest, which has a roughly 50% stake in MacMillan Bloedel, accounts for MB as a consolidated affiliate. Accordingly, to avoid double counting, MB's sales and half of its earnings are excluded from the totals line.
() = losses.

Spruce Falls Inc., the former Kimberly-Clark Corp. newsprint mill that was purchased last year by employees, community residents, and Tembec Inc., showed a modest profit for the three months ended June 30, 1992. The company reported consolidated net income of C\$1.1 million on net sales of C\$29.2 million. For the first six months of the year, the company has reported earnings of approximately C\$2 million on net sales of C\$64.7 million.

Gloomy forecast. Two major reports on the outlook for the Canadian forest products industry (both released in August) presented a gloomy forecast of massive shutdowns and layoffs and the need for up to an estimated C\$35 billion in modernizations and expansions to aid the ailing industry's adjustment to vastly changing economic circumstances. Included in the recommendations made by the industry in one of the reports are calls for a change in national monetary policies, investor tax incentives, cheaper electricity, and the discouragement of federal recycling legislation in Canada.

The Forest Sector Advisory Council warned that the Canadian forest products industry will see mill clo-

sures, company mergers, and the elimination of 25,000 jobs before the end of the decade. A "Strategy for Growth" report suggests that the federal government adapt its monetary policy by ensuring that Canadian interest rates remain within one percentage point of U.S. levels to reduce the volatility of Canadian-U.S. exports, the most critical factor in the industry's performance.

• Gaylord Container Corp., based in Deerfield, Ill., reported a net loss of \$32.9 million on sales of \$190 million for its third quarter of fiscal 1992 ended June 30. The company reported a year-ago net loss for the same period of \$125.5 million on sales of \$171 million. Results for last year's third quarter included a \$125.2-million charge against operating earnings from a write-down of assets at the Antioch, Calif., East mill, which was idled in February of 1991.

• St. Joe Paper Co. reported net income of \$3.2 million on sales of \$143.6 million for the second quarter ended June 30. The company reported net income of \$6.3 million on sales of \$144.3 million for the same period a year ago. ■

U.S. Paper Industry's Trade Balance Remains Tipped in Favor of Exports

Despite a slight decline, exports continue to outpace imports by as much as seven times, with the Pacific Rim consuming the majority

By KELLY H. FERGUSON, Deputy Editor

The economic recession that hit the U.S. in 1990 caused a slight drop in 1991 forest product exports and a substantial decrease in imports. Based on U.S. Census Bureau import/export data, shipments of all forest products from the U.S. totaled almost 37 million tons in 1991 and had a dollar value of about \$11.5 billion. This constitutes a 2% decline from the 1990 level of more than 37.5 million tons (Table 1).

Imports of forest products, however, declined 12% in the same period—from 5.8 million tons in 1990 to 5.1 million tons in 1991 (Table 2). This drop in imports may have resulted from a decline in consumption of paper and paperboard by U.S. consumers, since the U.S. has traditionally been a large importer of paper and board.

The import and export information for this survey was compiled by Trade Inc., a company specializing in trade data compilation, and analyzed by *Pulp & Paper*. The survey incorporates all forest products shipments through seaports in the U.S. and its territories for 1990 and 1991. Due to the method in which the U.S. Census Bureau labels shipments, individual grade-by-grade analysis was not possible. A general evaluation can be made though, based on knowledge of ports and the major shipments moving through them. Shipments were divided into five major categories:

- Paper and paperboard, cut to size or shape
- Paper and paperboard (general)
- Pulp and wastepaper
- Wood in the rough or roughly squared
- Wood, simply worked, and railway sleepers of wood.

TRADE BALANCE? Despite a much-publicized U.S. trade imbalance, the pulp and paper industry is a shining star in taking its products overseas. The U.S. exports more than seven times the tonnage of forest products it imports (Figure 1 illustrates this dramatic ratio). Based on those 1991 tonnages, the dollar value of exports is more than three times that of imports.

In terms of tonnage, "wood in the rough" (probably chips, logs, etc.) made up the largest single category in

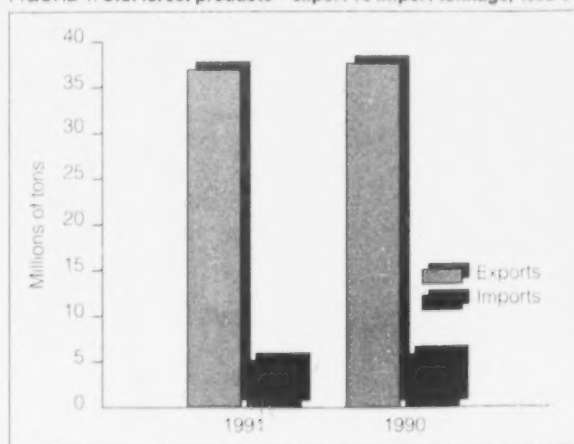
1991 at 15.5 million tons. This is followed by "pulp and wastepaper" (10.8 million tons); "paper and paperboard" (5.9 million tons); "wood, simply worked" (4.2 million tons); and "paper and paperboard, cut to size" (328,000 tons).

The dollar value for these same shipments, though, makes "paper and paperboard" (\$3.8 billion) the biggest money-making export in the forest products categories. The combined wood categories make up more than \$3.8 billion, followed closely by "pulp and wastepaper" at \$3.2 billion, and then "paper and paperboard, cut to size" at \$623 million.

On the import side, most of the 1991 tonnage, as well as the dollar value, falls into the "paper and paperboard" category (2.9 million tons at more than \$2 billion dollars). "Wood, simply worked" was the next largest import category at more than 1 million tons. The U.S. also imported almost 1 million tons of "pulp and wastepaper," which means mostly market pulp, since the U.S. imports very little wastepaper.

WHO GETS IT? WHO GIVES IT? From Algeria to Zimbabwe, countries around the world receive pulp, paper, and raw wood from the U.S. Japan is, by far, the largest

FIGURE 1: U.S. forest products—export vs import tonnage, 1990-91.



importer of forest products from the U.S., receiving almost 40% (14.7 million tons) of total U.S. exports. Although exact numbers are difficult to analyze due to the classification differences between the paper industry and the Census Bureau, much of that tonnage was in the raw wood categories.

Other Pacific Rim countries are also major importers of U.S. forest products. Korea, although a distant second to Japan, imported almost 5 million tons in 1991, followed by Mainland China (2.5 million tons) and Taiwan (2.2 million tons). European countries also import a large amount from the U.S., with Italy (1.4 million tons), the Federal Republic of Germany (997,000 tons), and the United Kingdom (833,272 tons) leading the way.

While not as extensive as the importer "who's who" list, shipments of forest products into the U.S. also come from all over the world. Canada is the largest exporter with 2.6 million tons, making up almost 55% of the total U.S. imports for 1991. Most of that tonnage was in "paper and paperboard" most likely as newsprint being shipped to the various large metropolitan areas. Canada

also exported a fairly large amount of wood into the U.S.

Brazil follows Canada as a major supplier of forest products to the U.S. In 1991, Brazil shipped 572,000 tons of forest products to the U.S., the majority of which was pulp. Finland, at 450,000 tons, was the third largest exporter (mostly paper and paperboard), followed by the Federal Republic of Germany (159,000 tons) and Sweden (153,000 tons).

KEEPING PORTS BUSY. Despite the slight decline in shipments from 1990 to 1991, the pulp and paper industry continues to keep U.S. seaports busy with large numbers of shipments. *The Pulp & Paper Forecaster* predicts that both exports and imports will continue to increase, at least through 1994, as U.S. paper companies expand their global presence through overseas marketing efforts, joint ventures, and investments in foreign mills.

According to the 1991 import/export survey by *Pulp & Paper*, many U.S. seaports have already begun to expand their facilities and are aggressively seeking forest products business. The data for this article listed more

TABLE 1: Forest products exports, 1990-91.

Port	1991		1990		% change, 1990 vs 1991 tonnage
	Tonnage	Value (\$000)	Tonnage	Value (\$000)	
Longview, Wash.	3,338,034	603,452	3,171,260	537,666	5%
Tacoma, Wash.	3,076,528	1,466,828	3,536,665	1,679,651	-13%
Aberdeen-Hoquiam, Wash.	2,298,815	271,296	2,329,537	271,785	-1%
New York, N.Y.	1,700,186	508,806	1,764,760	469,837	-4%
Seattle, Wash.	1,683,220	773,889	1,795,779	896,480	-6%
Mobile, Ala.	1,671,306	617,916	1,416,623	600,821	18%
Charleston, S.C.	1,553,233	744,393	1,355,226	697,738	15%
Ketchikan, Alaska	1,524,355	286,268	1,823,033	372,862	-16%
Savannah, Ga.	1,508,624	673,725	1,212,430	592,098	24%
Everett, Wash.	1,419,576	156,935	1,942,080	213,188	-27%
Portland, Ore.	1,297,952	421,182	1,610,709	472,171	-19%
Coos Bay, Ore.	1,287,735	327,893	1,623,630	388,170	-21%
Long Beach, Calif.	1,065,591	267,474	644,648	167,165	65%
Los Angeles, Calif.	1,015,296	275,863	1,166,046	360,430	-13%
Port Angeles, Wash.	984,651	103,242	1,406,819	146,734	-30%
Norfolk, Va.	932,046	477,026	886,637	439,761	5%
Oakland, Calif.	802,246	213,712	817,137	192,059	-2%
New Orleans, La.	739,109	361,140	615,733	310,502	20%
Wilmington, N.C.	609,041	244,286	604,482	287,879	1%
Olympia, Wash.	562,529	61,538	328,788	42,100	71%
Panama City, Fla.	498,337	181,856	457,370	192,880	9%
Eureka, Calif.	451,679	166,117	440,675	206,096	2%
Baton Rouge, La.	441,827	155,446	411,660	158,133	7%
Brunswick, Ga.	421,844	225,309	440,851	283,688	-4%
Astoria, Ore.	407,949	38,047	639,534	51,684	-36%
Baltimore, Md.	406,886	200,028	354,468	162,054	15%
Anacortes, Wash.	385,177	35,334	362,052	37,877	6%
Anchorage, Alaska	322,274	49,043	278,671	43,203	16%
Pascagoula, Miss.	287,082	109,938	202,015	86,463	42%
Jacksonville, Fla.	264,349	134,843	224,681	125,909	18%
Total — top 30 ports	32,957,477	10,152,825	33,863,999	10,487,084	-3%
Top 30 — % of total shipments	89%	88%	90%	89%	
Total — all ports	36,930,717	11,512,175	37,570,550	11,785,469	-2%

TABLE 2: Forest products imports, 1990-91.

Port	1991		1990		% change, 1990 vs 1991 tonnage
	Tonnage	Value (\$000)	Tonnage	Value (\$000)	
Long Beach, Calif.	576,851	397,602	555,207	390,306	4%
Seattle, Wash.	483,146	299,261	557,897	342,479	-13%
New York, N.Y.	462,918	382,245	423,877	403,824	9%
Philadelphia, Pa.	399,287	267,700	514,043	356,800	-22%
Baltimore, Md.	298,367	145,927	226,137	137,678	32%
Superior, Wis.	218,448	110,478	193,672	108,924	13%
Savannah, Ga.	217,096	104,021	231,783	116,751	-6%
Port Canaveral, Fla.	183,656	91,486	123,947	50,551	48%
San Juan, P.R.	178,771	87,395	189,649	93,478	-6%
Charleston, S.C.	163,810	146,859	251,290	213,404	-35%
Houston, Texas	163,792	115,586	242,797	153,636	-33%
Mobile, Ala.	163,604	76,049	147,838	79,932	11%
Los Angeles, Calif.	160,651	232,995	297,469	273,822	-46%
Chester, Pa.	146,523	69,921	209,260	115,424	-30%
Alexandria, Va.	139,451	73,492	151,668	79,260	-8%
San Francisco, Calif.	135,259	99,074	163,686	83,065	-17%
Norfolk, Va.	126,878	145,644	182,880	177,416	-31%
Port Everglades, Fla.	77,821	73,012	152,758	105,879	-49%
New Orleans, La.	67,193	41,706	74,968	50,287	-10%
Oakland, Calif.	62,077	68,580	61,733	64,179	1%
Wilmington, Del.	58,149	17,818	35,949	10,166	62%
Miami, Fla.	55,959	45,356	82,516	57,707	-32%
Jacksonville, Fla.	48,240	23,937	50,883	21,986	-5%
Portland, Maine	44,250	25,183	49,957	31,488	-11%
Tampa, Fla.	38,982	14,659	66,575	17,350	-41%
San Diego, Calif.	38,854	19,577	58,873	29,444	-34%
New London, Conn.	36,168	12,592	57,820	23,454	-37%
Camden, N.J.	33,688	13,023	26,367	11,527	28%
Port Hueneme, Calif.	29,446	11,469	38,932	22,000	-24%
Gulfport, Miss.	26,230	15,318	21,902	10,832	20%
Total — top 30 ports	4,835,565	3,227,965	5,442,333	3,633,049	-11%
<i>Top 30 — % of total shipments</i>	<i>95%</i>	<i>92%</i>	<i>93%</i>	<i>90%</i>	
Total — all ports	5,114,835	3,526,183	5,843,163	4,020,670	-12%

than 130 seaports that handled forest products in 1990 and 1991.

Tables 1 and 2 list the top 30 U.S. ports for both exports and imports. The tables show that these ports handled 89% of total 1991 export tonnage and 95% of total 1991 import tonnage.

In export tonnage, the northwestern ports, especially those in Washington State, clearly dominate. While this is due to the cluster of pulp, paper, and log and lumber operations in that area, the tonnages moving through these ports could diminish as limits are applied to the logging operations in that region. Many of these ports, with the notable exception of Olympia, Wash., have already experienced declines from 1990 to 1991.

Conversely, most of the ports in the South and Southeast made gains in the same period. For example, many of the Gulf Coast ports—Mobile, Ala.; New Orleans, La.; and Pascagoula, Miss.—experienced significant increases in export shipments.

Ports located near major metropolitan areas—Los Angeles, Calif.; New York, N.Y.; Philadelphia, Pa.; etc.—are

the beneficiaries of forest products imports; again, mostly paper and paperboard. However, in keeping with the decline in total import tonnages, many of the top 30 ports experienced large decreases in tonnage handled. ■

Survey changes

This is the third pulp and paper import/export survey done by *Pulp & Paper*. Unlike the surveys of the last two years, which were based on direct surveys of the ports, this article is based on total import and export data from the U.S. Bureau of the Census and compiled by John Sexton of Trade Inc. (146 N. Canal St., Seattle, Wash. 98103). This change was made to provide more thorough data on shipments through seaports. However, because of time constraints, Canadian ports could not be included. *P&P* hopes to include Canadian port information, as well as better grade breakdowns, in the 1993 report.

China Becoming Major Market with New "Open Door" Policy, Large Population

Need to reduce environmental problems and expand its industrial base drives mills in the People's Republic of China to invest in modern technology

By M. AL-SIMAANI, R. BERARD, P. MASSICOTTE, and P. SHARMAN

With one quarter of the world's population and a new "open door" policy, the People's Republic of China (PRC) is rapidly becoming the largest expanding market for the pulp and paper industry. As the birthplace of paper, the PRC has a long history of papermaking. However, increasing modernization and needs for education and communication have created a demand that has far outgrown China's current paper production capabilities.

New technology and huge investments will be necessary to replace the small paper mills that currently contribute to China's paper supply, and in turn, to its enormous environmental problems. The Canadian industry has played, and will continue to play, a leading role in the supply of equipment and technology to meet that growth and the challenge of producing high-quality pulp—efficiently and with minimal environmental impact—from a variety of raw materials.

CURRENT SITUATION. The PRC ranks fourth in the world among paper and paperboard producing countries, with 13.3 million tons in 1989. However, paper consumption per capita is only 11.6 kg, compared with the world average of 44 kg per capita.

More than 500 grades of pulp, paper, and board are being produced (in an estimated 5,000 paper mills and 9,000 pulp mills scattered around the country) to meet the basic demands of growing industries, education, agriculture, national defense, and other special needs. In addition, more than 850,000 tons of linerboard, kraft wrapping grades, newsprint, and printing and writing papers are imported to supplement the local production.

The PRC also ranks sixth in the world among pulp producing countries, with 9.3 million tons in 1989, mainly from nonwood plant fibers (7.8 million tons). The utilization of various agricultural residues and non-

TABLE 1: Pulp production in the People's Republic of China (1990).

	Total world production in 1,000 metric tpy	China's production capacity in 1,000 metric tpy	% of world total
Rice and cereal straw pulps	6,785	5,831	86
Bagasse pulp	2,740	391	14
Bamboo pulp	987	166	17

wood plants constitute the major source of fiber for pulp production.

According to a survey by the Food & Agriculture Organization of the United Nations (FAO), China is the world's leader in the utilization of rice and wheat straw for the production of pulp, making 86% of the world's total straw pulp in 1990. The same survey shows that China ranks second after India in the production of bagasse pulp and bamboo pulp.

Table 1 shows China's pulp production of major nonwood fiber pulps in 1990. Because of the scarcity of pulpwood in China, its production—at 1.5 million tons—represents only 16% of the total pulp production of 9.3 million tons.

Secondary fiber's contribution to the paper and board industry has increased steadily. Wastepaper consumption exceeded 3.3 million tons in 1989, most of which was imported.

FIBROUS RAW MATERIAL. Wood. The use of nonwood plant materials for pulp production in the PRC is not a matter of choice but of necessity. Forest resources in China are limited. Its total forest area of approximately 119 million hectares covers only 12% of the total land area and represents 0.12 hectares per capita, compared with the world average of 1.1 hectares per capita. Plant-ed forests account for about one quarter of the total forested area, the remainder being natural forest.

Most of the natural forest area is located in the north-east provinces of Heilongjiang, Nei-mongol, and Jilin. It

Mr. Al-Simaani is senior process engineer, Mr. Berard is project manager, and Mr. Massicotte is project engineer, NLK Consultants Inc. Mr. Sharman is president, NLK International.

FIGURE 1: Raw material locations.



consists of mixed coniferous stands such as pine, Chinese fir, spruce, and larch, and broad leaf species such as birch, aspen, and Mongolian oak. The southwestern provinces of Yunnan, Sichuan, and Xizang contain the second largest standing wood volume (Figure 1).

Due to the industry's shortage of woodfiber, the PRC government is undertaking an ambitious national reforestation program to expand China's forest area by assisting state and collective farms to establish managed forest stands. This plan, once realized, will increase the forest area to 20% of the total land area by the year 2000.

Straw and bagasse. Even with the expansion of the national forest, nonwood material will still constitute the major source of fiber for pulp production, despite the problems associated with its utilization. Agricultural residue is bulky to handle, collect, and transport. It is produced at fairly small scattered areas all over the country, with seasonal variations and a sharp peak in the late summer weeks. It has a tendency to deteriorate during storage if no special precautions are taken. These materials usually have short fibers and are rich in silica. This presents special technical problems in the chemical recovery process.

On the other hand, grasses have the advantage of a

chemical composition similar to hardwood, i.e., comparatively rich in carbohydrates and fairly low in content of an easily accessible lignin. This makes them easy to pulp and to bleach.

Although straw and bagasse produce short-fiber pulps with low tear strength, they are being used for good-quality printing, writing, and tissue papers at high percentages in the furnish. Other grades that require strength, such as linerboard, utilize these pulps blended with a higher percentage of long-fiber pulps.

Bamboo. Bamboo grows in the southern and western provinces of the country including Hunan, Sichuan, Fujian and Jiangsu (Figure 1). Bamboo forests cover an area of approximately 3.3 million hectares. Its lignin content is the highest among nonwood raw materials. However, it contains medium and long fibers, matching those of softwood pulps. Because of the high tear strength of bamboo pulp, it has a great potential for various blends of paper products. See Table 2 for some basic fiber properties of these various species.

MILL SIZES, NEW MILL CONFIGURATION. Pulp mills in China are classified into three categories according to production capacity:

- Small-size mills with a capacity of less than 10,000 tpy
- Medium-size mills with a capacity of 10,000 to 30,000 tpy
- Large-size mills with a capacity of more than 30,000 tpy.

Approximately 200 of the pulp mills are medium- and large-size and account for 42% of total pulp production. The remaining 58% is produced in a staggering number of small mills. It is therefore fair to say that these small mills have been a major contributor to the Chinese pulp and paper industry despite drawbacks, such as low operating efficiency and environmental pollution, due to lack of chemical recovery, in most small mills. Of the three main pulping processes (mechanical, semichemical, chemical), the majority of the mills employ the chemical process. With the exception of a few mills using the sulfite process, the dominant chemical process is alkaline (soda and kraft).

The main contributing factors to the presence of small mills include the following:

- Proximity to raw material resources reduces the cost of handling and transportation. Nonwood raw materials are bulky and scattered throughout remote areas.
- Normally, small mills serve local market needs within the province, thereby reducing the cost of final

TABLE 2: Raw material fiber properties.

Wood	Fiber length range (mm)	Average fiber dia (microns)
Temperate zone coniferous wood	2.7 to 4.6	38
Temperate zone hardwoods	0.7 to 1.6	26
Nonwood		
Bamboo	2.7 to 4.0	14
Bagasse	1.0 to 1.5	20
Rice straw	0.8 to 1.0	9
Wheat straw	1.0 to 1.5	15

product distribution since the state of the infrastructure, such as roads and rail, is problematic.

- Capital available for investment by provincial and municipal authorities and bank loans from within the country or from abroad are limited.

- Labor costs are low.

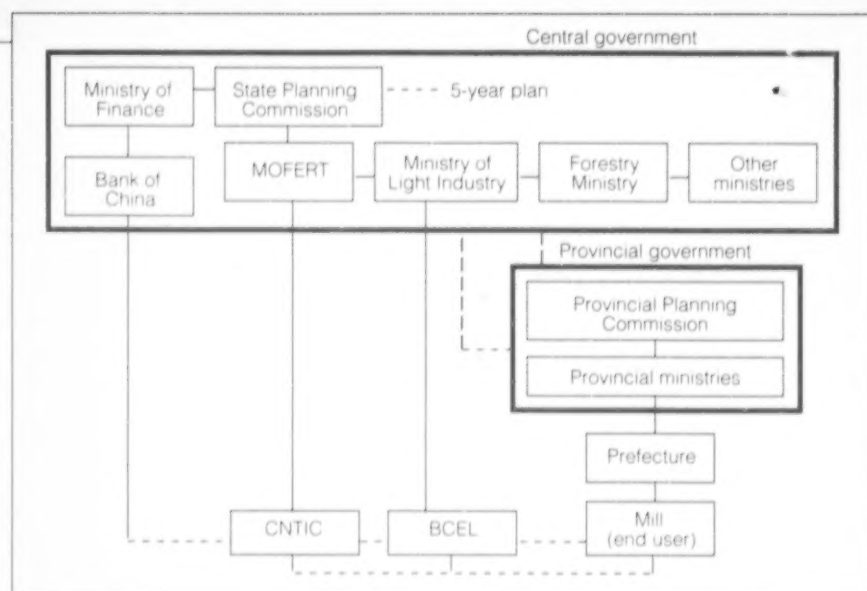
Today, almost all mills in the planning stage or under construction fall in the large-size mill category. The Ya'an pulp and paper mill (startup in 1994) in Sichuan Province is a typical example. The mill is designed to

Continues on page 74

Mill/ province	Raw material	End product/ capacity	Major international supplier
Ya'an/ Sichuan Province	Bamboo, Masson pine	Bleached kraft, P & W/ 55,000 tpy	Canadian Industrial Consortium (CIC)
Shaowu/ Fujian Province	Bamboo	Bleached kraft, P & W/ 50,000 tpy	Canadian Industrial Consortium (CIC)
Guangning/ Guangdong Province	Bamboo	Market bleached kraft/ 44,000 tpy	Beloit
Hanyang/ Hubei Province	Italian poplar	CTMP/ 35,000 tpy	Hymac
Guangzhou/ Guangdong Province	Masson pine	CTMP/ 50,000 tpy	Hymac
Dongguan/ Guangdong Province	Purchased pulp	Coated paper/ 29,000 tpy	Relocated major equipment from U.S.A.
Yalujiang/ Liaoning Province	Poplar	CTMP/ 46,000 tpy	Andritz Sprout-Bauer
Yue Yang/ Hunan Province	Masson pine	CTMP/ 26,000 tpy	Andritz Sprout-Bauer
Yangzhou/ Jiangsu Province	Secondary fiber	Coated board/ 42,000 tpy	Voith
Qingzhou/ Fujian Province	Pine	Unbleached kraft/ 150,000 tpy	Voith, ABB, Flakt, Sunds, Kamyr, Ahlstrom, Rauma-Repola
Xing Huo/ Jiangsu Province	Purchased pulp, secondary fiber	Coated boxboard/ 120,000 tpy	Valmet-Tampella, Sunds
Yantai/ Shandong Province	Purchased pulp	Boxboard/ 120,000 tpy	Valmet-Tampella
Yibin/ Sichuan Province	Bamboo	Kraft/ 42,000 tpy	Kamyr
Leshan/ Sichuan Province	Pine	Market bleached kraft, P & W/80,000 tpy	Relocated major equipment from Austria
Jiangmen/ Guangdong Province	Secondary fiber	Coated paper/ 50,000 tpy	Aikawa-Lamort, Black Clawson
Hexian/ Guangxi Province	Masson pine	Market bleached kraft/ 60,000 tpy	Sunds, Rauma-Repola, Ahlstrom

TABLE 3: Selected current projects in the People's Republic of China.

FIGURE 2: Government structure in the People's Republic of China.



produce 55,000 tpy of fully bleached kraft pulp for offset paper and market pulp from bamboo and masson pine.

Foreign equipment is being supplied by the Canadian Industrial Consortium Inc. (CIC) and includes major equipment for effluent treatment, raw material preparation, pulping, stock preparation, and evaporation. The design of the mill incorporates state-of-the-art technologies of oxygen delignification, three-stage bleaching (CDEOD), chemical preparation, and a chemical recovery system.

Equipment built and supplied from domestic manufacturing facilities in the PRC will include effluent treatment, raw material preparation, digesters, recovery boiler and power boiler, recausticizing system, pulp drying machine, and the paper machine. Table 3 outlines several current projects. Table 4 outlines proposed projects for the short term.

To minimize the impact of mill effluent on receiving waters, downstream users, land use, and related wildlife—specifically endangered species such as the Panda bear—the effluent treatment system for the Ya'an mill includes primary treatment to remove suspended solids and secondary treatment in an air-activated sludge system, followed by secondary clarifiers to ensure that discharged effluent will meet the following local and provincial guidelines:

- Biological oxygen demand (BOD)—100 mg/l
- Chemical oxygen demand (COD)—350 mg/l
- Suspended solids—200 ppm.

TECHNICAL/MANUFACTURING CAPABILITIES. Technical. Since the founding of the People's Republic of China in 1949, the pulp and paper industry has made significant increases in paper and board production (from 108,000 tons in 1949 to 13.3 million tons in 1990), as well as advances in process machinery and nonwood fiber processing technology. This was attained mainly through the devotion and hard work of the nation's scientists, researchers, engineers, chemists, and workers.

The Paper Industry Research Institute of China (PIRIC) was established in 1965 in Beijing to serve the pulp and paper industry. PIRIC serves as the national research center of China's pulp and paper industry under the direct supervision of the Ministry of Light Industry to carry out laboratory R&D in the fields of pulping, papermaking, coating, and environmental protection technologies.

TABLE 4: Selected proposed projects in the People's Republic of China.

Mill/ province	Raw material	End product/ capacity
Lonyang/ Fujian Province	Mawei pine	BCTMP/ 35,000 tpy
Mudanjiang/ Heilongjiang Province	Pine, poplar, birch, larch	Kraft/ 100,000 tpy CTMP/ 70,000 tpy
Daxinganling/ Heilongjiang Province	Birch, larch	Sack paper/ 50,000 tpy
Leizhou/ Guangdong Province	Eucalyptus	Bleached kraft/ 50,000 tpy
Yakeshi/ Nei-Mongol Province	Birch, larch	BCTMP/ 150,000 tpy
Shanwei/ Guangdong Province	Wood	Kraft/ 150,000 tpy
Shandong Yellow Sea/ Shandong Province	Pine, hardwood	Bleached kraft/ 160,000 tpy
Lijiang Peninsula/ Shanghai County	Pine	Kraft/ 100,000 tpy CTMP/ 200,000 tpy
Tianjin #4/ Tianjin Province	Purchased and domestic bleached kraft pulp	Coated paper/ 40,000 tpy
Yunnan Simao/ Yunnan Province	Pine	Bleached kraft/ 50,000 tpy
Zhejiang Consortium/ Zhejiang Province	Unknown	Coated board/ 34,000 tpy
Nanning/ Guangxi Province	Masson pine	Market bleached kraft/ 102,000 tpy

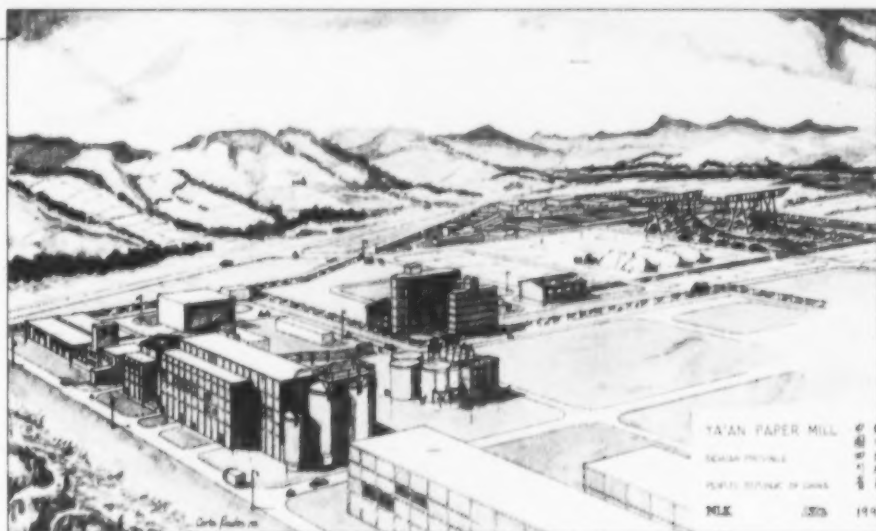


FIGURE 3: Artist's rendering of the Ya'an Paper Mill, which is jointly funded by the People's Construction Bank of China, the Sichuan government, and the Canadian government.

PIRIC acts also as a national center for standardization and quality control for the pulp and paper industry. Overseas institutes such as the Pulp & Paper Research Institute of Canada (PAPRICAN) have been instrumental in assisting with this program.

Manufacturing. As for local supply capabilities, the Chinese-supplied equipment is mostly oriented toward small-size plants. The PRC pulp and paper equipment manufacturing plants have produced equipment of good quality. However, the main problems facing manufacturing facilities are the lack of technology needed to manufacture state-of-the-art equipment, and the unavailability of the special metallurgy required to manufacture process equipment able to withstand the corrosive conditions of modern pulping and bleaching.

Therefore, many joint ventures have been set up to provide this new technology, along with technology transfer. The following are examples of equipment manufacturing facilities in the PRC:

- Fourdrinier paper machines, cylinder board machines, calenders, pulp washers, pressure screens, refiners, heaters, etc., produced in Shanghai
- Paper machines in Xian (joint venture with Valmet)
- Pulping equipment in Tianjin (joint venture with Sunds to produce horizontal continuous digesters)
- Board machine in Liaoyang (joint venture with Voith)
- High-intensity rubber rolls in Xian (joint venture with Beloit)
- Centrifugal pumps for the chemical and petrochemical industries in Dalian
- Many joint ventures in various locations for manufacturers of electrical equipment, instrumentation, and valves.

ORGANIZATION. Long-range planning is done by the Central Government as it draws out the five- and ten-year plans in conjunction with provincial and local governments. Potential projects are screened by the Ministry of Foreign Trade (MOFERT) to determine which projects might qualify for funding under agreements with foreign countries such as Canada or the World and

Asian Development Banks.

Once a project is selected, MOFERT assigns an agency such as China National Technical Import & Export Corp. (CNTIC) to work on its behalf and that of the end user to negotiate a contract with potential suppliers. Once the contract is signed, it must be ratified by each country's government before financing is put into place and the project is given the go-ahead.

Contracts being executed are led by the Ministry of Light Industry, which appoints a design institute such as the Beijing Consulting & Engineering Corp. for Light Industry (BCEL) to serve as the consultant to the end user and to interface with the supplier and its engineering arm. Figure 2 illustrates this government structure relative to the projects.

All of these contracts are set up to maximize technology transfer. The prepared technical documentation is reviewed in a series of design liaison meetings in order to study the preliminary and detail engineering. Most of these projects also incorporate some form of training, both hands-on and classroom.

The Ya'an Paper Mill is an example of such a project. The mill is jointly funded by the People's Construction Bank of China, the Sichuan Government, and Canadian Government financing of US\$35.5 million for the purchase of equipment from Canada. Project management and detail engineering is provided by BCEL. Construction management is by the end user.

Such contracts typically take 36 to 42 months to execute from the beginning of the project to plant commissioning and startup. However, many years of proposal, review, and negotiation may take place prior to the actual signing and ratification of the contract. This requires a considerable marketing effort that must be borne by the international suppliers.

OUTLOOK. The "open-door" policy adopted and encouraged recently by the Government of China is expected to reflect on the growth of the national economy, specifically the industrial sector. The pulp and paper industry will have to keep pace with the economic and so-

cial development. Certain products such as newsprint, linerboard, and printing papers will have to be given priority to fill the gap between supply and demand and to reduce imports.

For the industry to face the challenge of meeting a production target of 19 to 20 million tons of paper and board by the end of the century, many facets of the industry have to be addressed, for example:

- **Raw materials:** Organized planning to ensure continuous supply of raw materials to this growing industry.
- Wood: To be given first priority due to the shortage of long fiber and as a potential raw material for mechanical pulp. Massive reforestation of selected species.
- Bamboo: More cultivated areas. This fiber has excellent potential.
- Bagasse: Increased utilization as a fiber source.
- Reed: Expansion of managed plantations.
- Capital investment from local and foreign sources.
- Implementation of necessary modifications to update existing mills to improve production efficiency and recovery of chemicals. Minimize mill effluent impact on environment and enhance product quality with special emphasis on quality control.
- Increased use of secondary fiber.
- Optimization of product furnish (i.e., maximize short fiber proportion while maintaining product quality).

• Further R&D to deal with problems specific to the Chinese pulp and paper industry.

• Increased product development from available local resources.

SUMMARY. Certainly, the PRC represents a major potential market for suppliers to the pulp and paper industry. This market has recently opened up to worldwide technology—instead of only to the traditional Scandinavian suppliers.

It will be a long time before mills in China are built the size normally seen in the Western world. However, all new mill designs have incorporated the most advanced technological innovations regardless of the size of the installation.

With the cost of imported pulps and waste soaring, the technology of nonwood pulping will continue to develop at a rapid rate. Wood resources will be limited for some time, certainly until forest management practices are improved. Also, as those in the PRC point out, nonwood species such as bamboo vary from province to province, requiring individual design consideration.

NLK expects the current surge in new mills to continue for several decades. Most recently, NLK has assisted with consulting engineering services for the Ya'an, Shaowu, Dougguan, and Guangning projects. ■

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